

**SITE INSPECTION  
TASK WORK PLAN**

**QUAIL CREEK LANDFILL  
GARLAND, DALLAS COUNTY, TEXAS  
EPA CERCLA ID NO.: TXD980697205**

Prepared for:

U.S. Environmental Protection Agency  
Region 6  
1445 Ross Avenue  
Dallas, Texas 75202

Contract No.: 68-W9-0015  
Work Assignment No.: 23-6JZZ  
Document Control No.: 4603-23-0297

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November 1996

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TASK WORK PLAN**

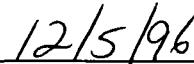
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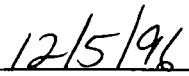
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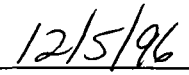
  
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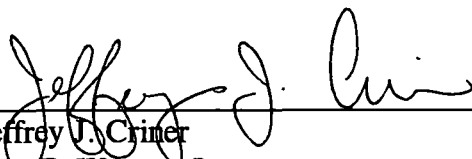
  
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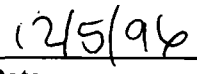
  
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## **SECTION 1 INTRODUCTION**

Under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA), Roy F. Weston, Inc. (WESTON®) has been tasked to perform a Site Inspection (SI) of the Quail Creek Landfill (QCL) site (EPA CERCLA Identification No. TXD980697205) located in Garland, Dallas County, Texas (Figure 1-1). Based on available site information, WESTON believes that the site is presently eligible for action under CERCLA/SARA. The U.S. Environmental Protection Agency (EPA) Region 6 retained WESTON to complete this investigation under EPA Contract No. 68-W9-0015 and Work Assignment No. 23-6JZZ.

This document represents the Task Work Plan (TWP) for the SI. The purpose of this document is to summarize available background information for the site and, based on this information and the results of the site reconnaissance, propose sample locations and field procedures for the SI.

### **1.1 PURPOSE OF THE INVESTIGATION**

The SI is the second investigation in a series of screening assessments in which EPA evaluates hazardous waste sites under CERCLA/SARA. The purpose of this SI is to identify immediate or potential threats that hazardous substances attributable to the site may pose to human health and the environment. This is accomplished by documenting the existence and migration of hazardous substances related to the site and by identifying the receptors, or targets, potentially exposed to the hazardous substances. EPA will use the information obtained during the SI to evaluate the site using the Hazard Ranking System (HRS) and to help decide if the site is a potential candidate for inclusion on the National Priorities List (NPL). Depending on the results of the SI, EPA may propose the site for listing on the NPL, decide that further investigation of the site is required, or determine that no further action should be taken at the site under CERCLA/SARA.

### **1.2 SCOPE OF WORK**

The scope of work for the SI will focus on obtaining the most important background information and analytical data required to evaluate the site using the HRS. WESTON will complete the following major tasks as part of this SI:

- Obtain and review available background information concerning the site.
- Research data related to the groundwater, surface water, soil exposure, and air pathways.
- Conduct an off-site reconnaissance to document current site conditions, identify potential receptors or targets of a release, and select sample locations.



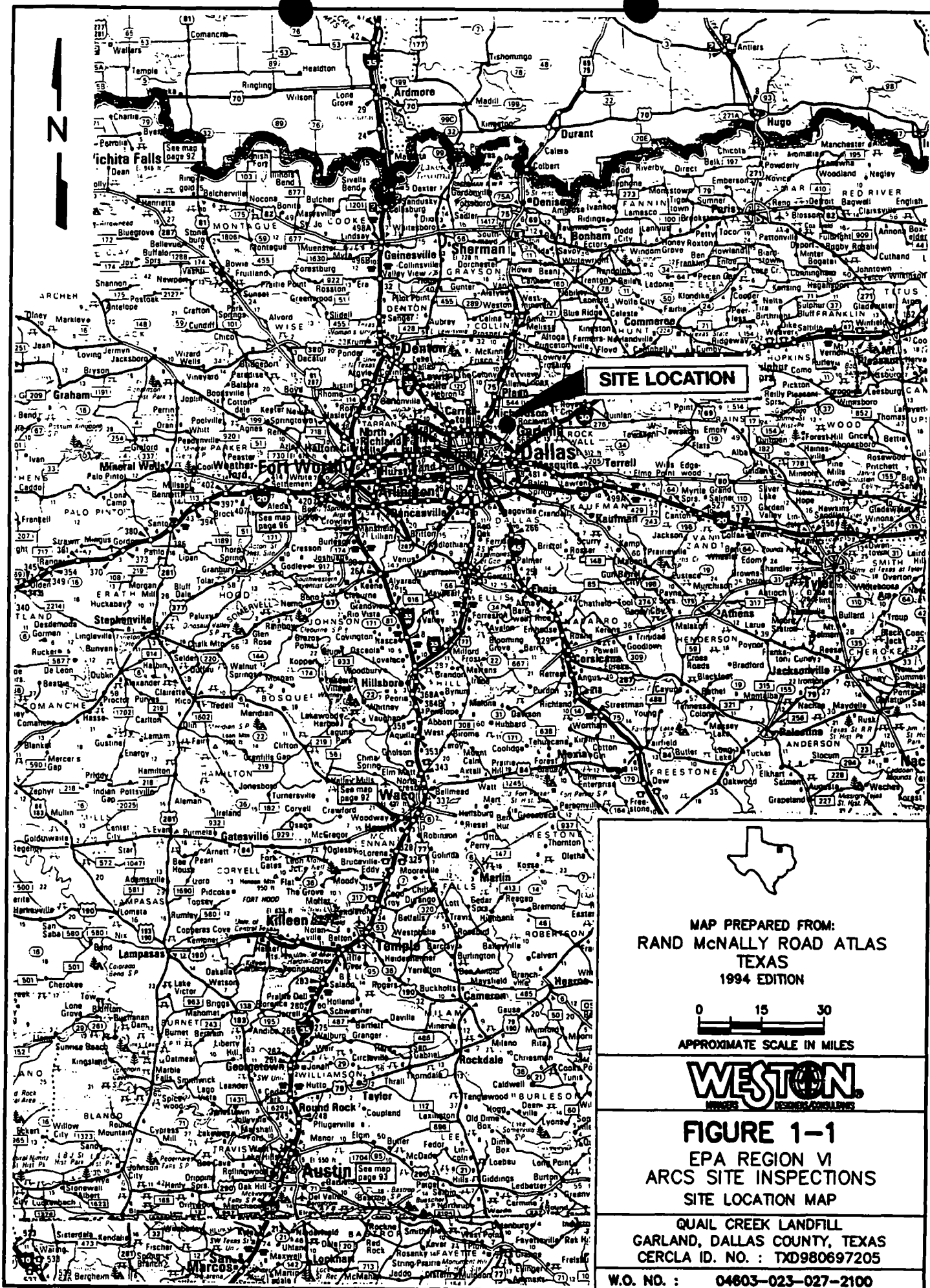
- Prepare a site-specific Task Work Plan (TWP) and a Health and Safety Plan (HASP) describing planned sampling activities and appropriate safety protocol.
- Conduct environmental sampling near the site.
- Prepare a Site Inspection Final Report to document the results of the off-site reconnaissance, sampling activities, and sample analyses as well as to present the background information obtained for the site.

### **1.3 WORK PLAN ORGANIZATION**

The SI TWP has been organized in a format that is intended to facilitate application of information in the report to the HRS. The work plan is organized as follows:

- Section 1 — Introduction,
- Section 2 — Site Background Information,
- Section 3 — Exposure and Migration Pathway Characteristics,
- Section 4 — Sampling Visit Activities, and
- Section 5 — Project Information.

A copy of the site access agreement is provided in Appendix A, the site-specific HASP is provided in Appendix B, sampling procedures are provided in Appendix C, Contract Laboratory Program (CLP) Guidelines are provided in Appendix D, and Site Evaluation Checklists are provided in Appendix E.



## **SECTION 2**

### **SITE BACKGROUND INFORMATION**

A summary of the location, description, site history, previous investigations, source waste characteristics, and concerns of the site is presented in the following subsections. The site background information presented in this TWP has been obtained from reports previously completed for the site, as well as WESTON's recent site reconnaissance.

#### **2.1 SITE LOCATION AND DESCRIPTION**

The QCL site is an inactive landfill located in Garland, Texas. The site is bounded by Union Pacific Railroad tracks to the north, Highway 66 to the northwest, Mills Branch creek to the south, and Centerville Road to the east. The geographical coordinates for the site are latitude 32°54'19" North and longitude 96°36'24" West. A Site Area Map is provided as Figure 2-1.

The QCL encompasses approximately 35 acres. The landfill is located on two separate parcels and the total area of the two parcels is over 58 acres. Currently, the site is vacant. There are no buildings or other structures on-site. The site is heavily vegetated and dumping of trash, wood waste, tires, etc. has occurred since the landfill stopped receiving refuse. Three groundwater monitoring wells are located near the northeastern boundary of the site. Two wells are located on-site and one well is located off-site near the Union Pacific Railroad tracks. The exact location of the three wells is not known at this time. There is no documentation that these wells have been previously sampled.

Other physical features of the site are Mills Branch Creek that trends from the northwest to the southeast through the middle of the site. A drainage channel is located in the northern part of the site and drains into Mills Branch Creek. Site access is limited by a fence on the eastern side of the site along Centerville Road. The north, south, and west sides of the site are not fenced and access is unrestricted. A dirt road enters from the northwest corner of the site. A Site Plan Map is provided as Figure 2-2.

#### **2.2 SITE HISTORY**

The City of Garland, which leases the property, disposed of approximately 73,000 tons of refuse at the landfill from May 1972 to March 1975. Reportedly, the landfill was exclusively filled with municipal waste. The landfill had a 2-foot final cover of topsoil applied after disposal activities ceased. Although the site does not have an engineered liner, the site is noted to have a 3-foot natural clay liner.

## **2.3 SUMMARY OF PREVIOUS INVESTIGATIONS**

WESTON reviewed available EPA file information for the QCL site. A "Potential Hazardous Waste Site Identification and Preliminary Assessment" report form was filed by the Texas Department of Health (TDH) on 24 February 1981.

## **2.4 SOURCE WASTE CHARACTERISTICS AND SITE CONCERNS**

Information concerning the known or potential hazardous waste source areas (HWSAs) at the site and the constituents thought to be associated with each source is provided in the following subsections along with a summary of potential concerns associated with contaminant migration and exposure.

### **2.4.1 Source Waste Characteristics**

Based on available background information and the results of WESTON's site reconnaissance, 10 distinct landfill cells have been identified at the site. All 10 cells are potential HWSAs. The areas of the cells are estimated as follows:

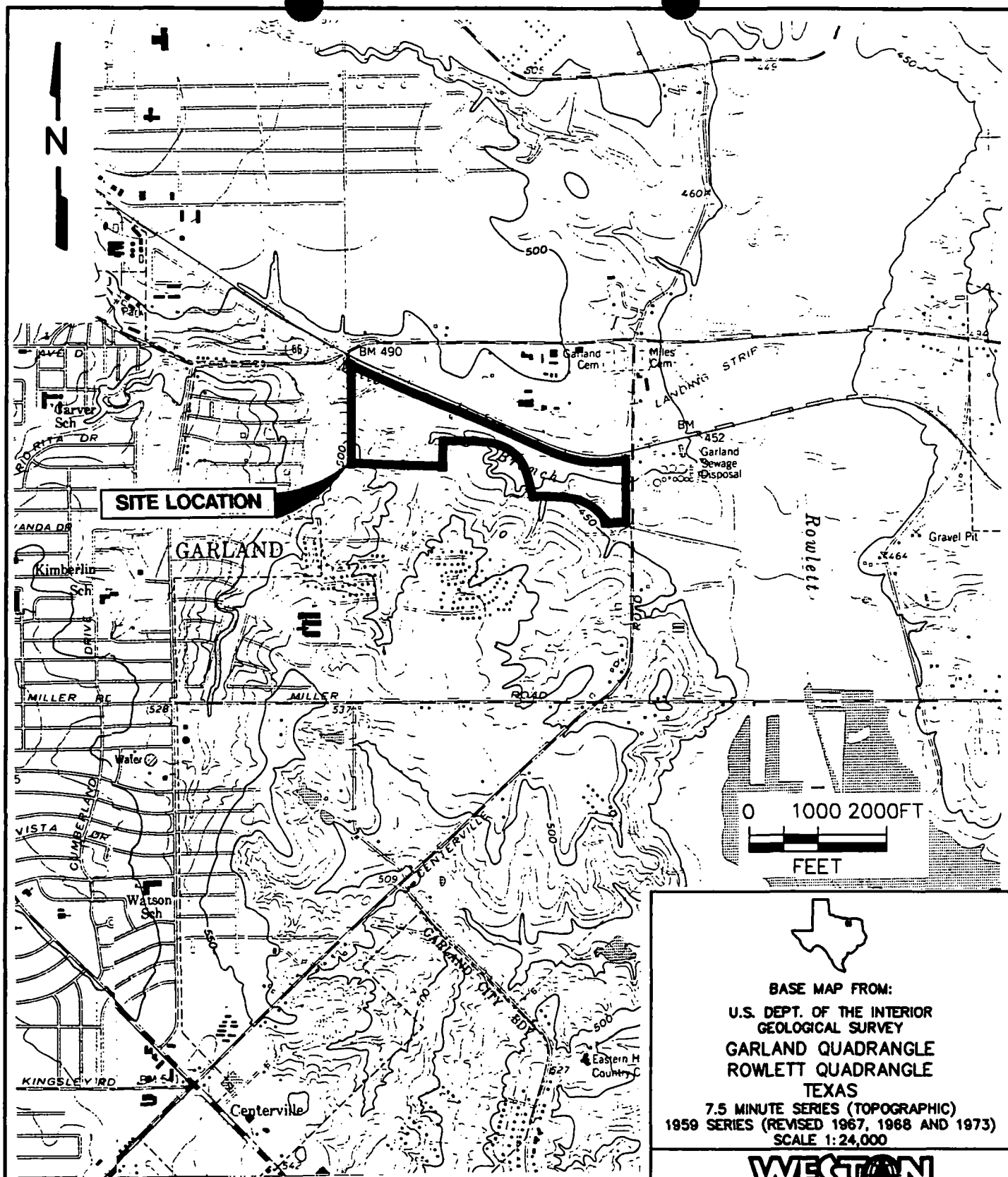
<u>CELL NUMBER</u>	<u>LENGTH (ft)</u>	<u>WIDTH (ft)</u>
A1	900	60
A2	900	60
A3	2,400	60
B1	875	80
B2	850	80
B3	950	80
C	750	60
D	500	80
E2	475	60
F2	450	80

The depth of each of the cells is unknown. There are no known containment features associated with the HWSAs.

### **2.4.2 Site Concerns**

Possible concerns associated with the HWSAs at the site are the migration of or exposure to potential hazardous substances associated with the landfill because the landfill has no containment features. Potential concerns include the following:

- The groundwater pathway is of concern because the landfill is not lined. A possibility exists for vertical contaminant migration into groundwater.
- A release to the surface water pathway is of concern because the site has no containment features and there is a possibility of contaminant migration into Mills Branch Creek.
- The soil exposure and air pathways are of no concern because the landfill is covered and heavily vegetated.



BASE MAP FROM:

U.S. DEPT. OF THE INTERIOR  
GEOLOGICAL SURVEY

GARLAND QUADRANGLE  
ROWLETT QUADRANGLE  
TEXAS

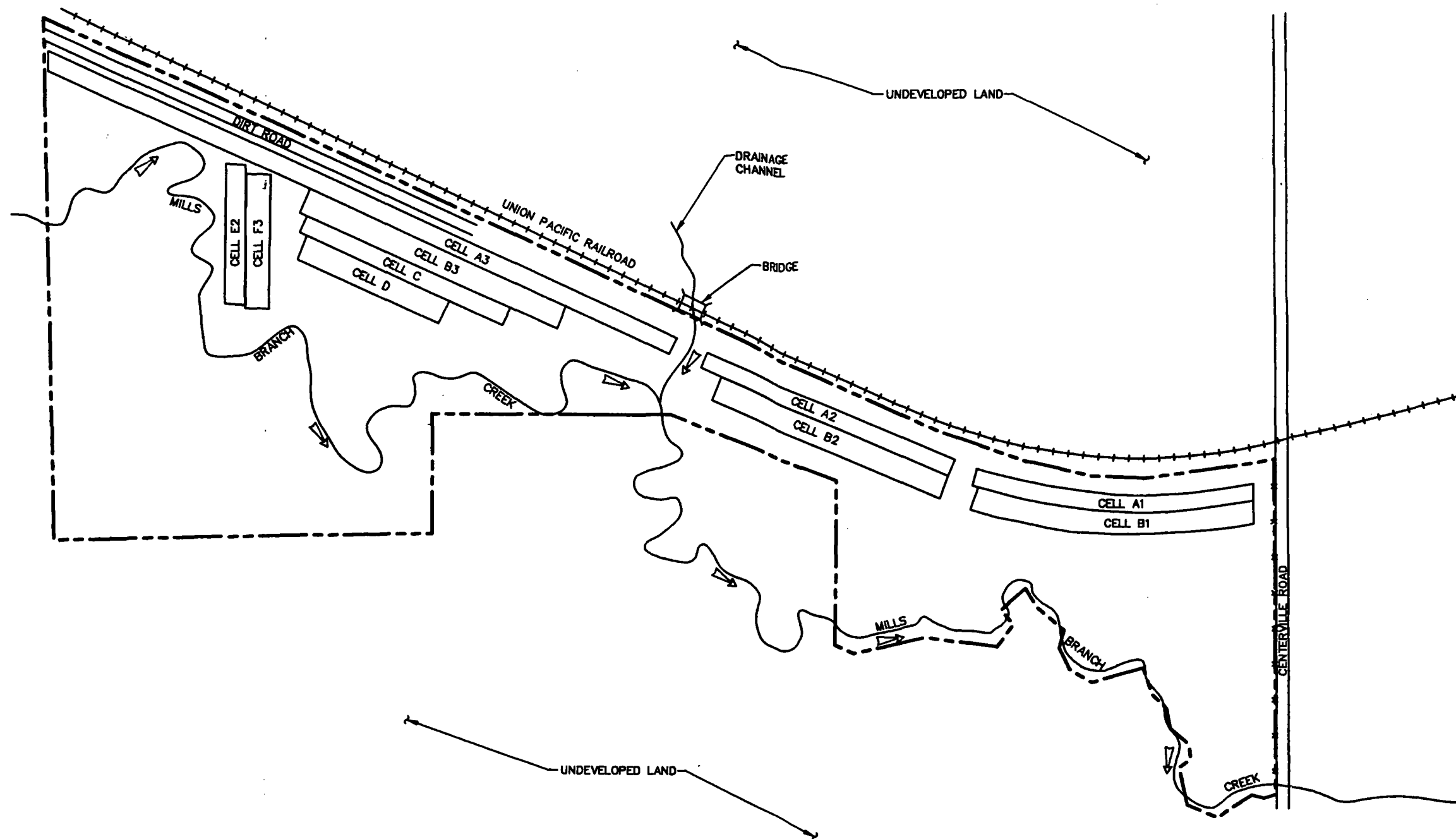
7.5 MINUTE SERIES (TOPOGRAPHIC)  
1959 SERIES (REVISED 1967, 1968 AND 1973)  
SCALE 1:24,000

**WESTON**  
ENGINEERS & CONSULTANTS

**FIGURE 2-1**  
EPA REGION VI  
ARCS SITE INSPECTIONS  
SITE AREA MAP

QUAIL CREEK LANDFILL  
GARLAND, DALLAS COUNTY, TEXAS  
CERCLA ID. NO. : TXD980697205

W.O. NO. : 04803-023-027-2100



**LEGEND:**

- PROPERTY BOUNDARY
- FLOW DIRECTION
- ++++ RAILROAD
- x-x-x- FENCE

0 200 400  
SCALE IN FEET



**FIGURE 2-2**  
EPA REGION 6  
ARCS SITE INSPECTIONS  
SITE PLAN MAP

QUAIL CREEK LANDFILL  
GARLAND, DALLAS COUNTY, TEXAS  
CERCLA ID. NO. : TXD980697205

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## **SECTION 3**

### **EXPOSURE AND MIGRATION PATHWAY CHARACTERISTICS**

Information regarding the groundwater, surface water, soil exposure, and air pathways is presented in the following subsections. Known data gaps are identified at the end of the section.

#### **3.1 GROUNDWATER PATHWAY**

Available information concerning the groundwater pathway, one of the primary routes of potential hazardous substance migration and exposure, is summarized in the following subsections.

##### **3.1.1 Hydrogeologic Setting**

The site is located in the western portion of the East Texas Province. The regional geologic setting is characterized by mixed thick sequences of tyrogenous (sandstone, siltstone, shale) and carbonate (limestone, dolomite) units that appear relatively undeformed. The general orientation of these strata, including the regional fault pattern, is northeast-southwest. The local geological setting is described as the Ozan formation ("lower Taylor marl"), which has a thickness of greater than 500 feet. The native clays have a variable permeability and are characterized by moderate to very high shrink-swell.

##### **3.1.2 Likelihood to Release**

Available information reveals no documentation of a release of contaminants attributable to the site to groundwater at the site. However, the landfill is not lined and there is, therefore, a potential for a release to the groundwater pathway. The landfill was constructed in clays of variable permeabilities and the leaching potential from the bottom of the landfill to groundwater may be significant. The gross precipitation in the Garland area is approximately 35 inches per year. There are three groundwater monitoring wells located at the site. The type and depth of the wells are not known at this time.

##### **3.1.3 Groundwater Pathway Targets**

The City of Garland and adjacent cities rely primarily on surface water (Lake Levon or Lake Ray Hubbard) for domestic water use. No municipal wells are known to exist within 4 miles of the site. There have been no private drinking water wells identified within 1 mile of the site.

#### **3.2 SURFACE WATER PATHWAY**

Available information concerning the surface water pathway is summarized in the following subsections.



### **3.2.1 Hydrologic Setting**

Surface water from the site drains into Mills Branch Creek, which trends through the middle of the site. Mills Branch Creek is considered the probable point of entry (PPE). Mills Branch Creek drains into Rowlett Creek, which is located approximately 0.5 mile east of the eastern landfill boundary. Rowlett Creek and Mills Branch Creek are considered to be a perennial water bodies, based on information provided by U.S. Geological Survey (USGS) topographic maps. Rowlett Creek then discharges less than 0.5 mile south into Lake Ray Hubbard. Lake Ray Hubbard is used as a main water supply for the City of Dallas and other municipalities. The locations of the drinking water intakes within Lake Hubbard have not been determined.

The 15-mile downstream segment ends on the east fork of the Trinity River, located south of Lake Ray Hubbard.

### **3.2.2 Likelihood to Release**

Based on the information available, a release to surface water from the site is likely because the landfill has no containment features and runoff from the site may drain into Mills Branch Creek and Rowlett Creek.

### **3.2.3 Surface Water Pathway Targets**

Based on the information available, there are no federal- or state-designated sensitive environments along the 15-mile downstream segment. However, portions of designated wetlands may be present along the 15-mile downstream segment.

Mills Branch Creek is not believed to be used for fishing or to have any other resource uses. Rowlett Creek is used for recreational fishing. There are no known drinking water intakes or other water resource uses along Rowlett Creek to its outlet into Lake Ray Hubbard. Lake Ray Hubbard and the east fork of the Trinity River south of Lake Ray Hubbard are also used for recreational fishing.

There are no known drinking water intakes or other water resource uses along the east fork of the Trinity River from Lake Ray Hubbard to the end of the 15-mile downstream segment.

## **3.3 SOIL EXPOSURE**

Available information concerning the soil exposure threat is provided in the following subsections.

### **3.3.1 Surficial Conditions**

Information regarding soil conditions at the site is not known at this time.

### **3.3.2 Likelihood of Exposure**

Exposed refuse, which has been recently dumped at the site, is visible in some areas. However, no areas of stressed vegetation or stained soils were noted by WESTON team members during the field reconnaissance. Access to the site is unrestricted, thus there is the potential for exposure to contaminated soil.

### **3.3.3 Soil Exposure Targets**

The primary targets for the soil exposure pathway are business and public works facilities located on the north side of the Union Pacific Railroad tracks and across Centerville Road. No schools, residents, or day-care facilities or terrestrial sensitive habitats are located within 200 feet of the site. Since the property is not completely fenced, secondary targets may include these residents and any people who enter the site.

## **3.4 AIR PATHWAY**

Available information concerning the air pathway is presented in the following subsections.

### **3.4.1 Atmospheric Conditions**

Information concerning the weather conditions and patterns in the site vicinity is currently unknown.

### **3.4.2 Likelihood to Release**

Based on available information, the site has a 2-foot topsoil cover, is densely vegetated, and a release to the air pathway is not expected.

### **3.4.3 Air Pathway Targets**

Potential targets of the air pathway include the nearby population working and living within 4 miles of the site as well as any sensitive environments that may be in the area. These targets have been described in the previous pathway sections.

## **3.5 DATA GAPS**

Several nonsampling-related data gaps have been identified based on review of the background information. WESTON will close as many of these data gaps as possible as part of the SI sampling visit. The major data gaps are as follows:

- Documentation of the surface water drainage pathway is needed to locate potential pathway targets.

- Endangered species habitats near the site which may be affected by the facility, need to be identified to possibly establish additional pathway targets.
- Drinking water intakes need to be identified along Lake Ray Hubbard.

WESTON also will conduct additional background research as time permits to close remaining nonsampling data gaps such as environmental setting information and target documentation.

## **SECTION 4**

### **SAMPLING VISIT ACTIVITIES**

The activities planned for the SI sampling visit are outlined in this section of the TWP. The sampling strategy presented is based on the operational history, known source waste characteristics, the probable pathways of contaminant migration, and the likely targets related to the site. The SI field activities will focus primarily on sampling the pathways of contaminant migration.

WESTON will complete surface water and bottom sediment sampling activities as part of the SI.

Samples will be collected using sampling techniques and quality control procedures that generally meet EPA Region 6, EPA CLP, and WESTON guidelines. The specific tasks that will be performed during the sampling visit are described in Subsections 4.2, 4.3, and 4.4. It is expected that the tasks will be completed in the order outlined in these subsections. However, some tasks may overlap with others. General information for each task is provided as instructions to guide the field team.

It is important to note that the intent of the sampling mission is to sample what appear to be the most contaminated materials in the areas targeted for sampling. Based on available information and the results of the site reconnaissance, WESTON has selected locations for sampling that appear to be those most likely to provide positive evidence of the presence of hazardous substances on-site.

#### **4.1     FIELD PERSONNEL**

WESTON plans for a field team consisting of three or four personnel to complete the tasks described in the following subsections. The anticipated personnel, along with their respective project roles and responsibilities, are identified in Table 4-1.

#### **4.2     MOBILIZATION TASKS**

The tasks that the WESTON field team generally will complete prior to sampling are described in this subsection.

##### **4.2.1   Task 1 — Mobilization**

The WESTON field team will mobilize from the WESTON Regional Equipment Stores (RES) warehouse in Houston, Texas. One or two team members will load equipment for the SI sampling visit in a van, quality checking the equipment in the process. An equipment checklist will be used to verify that the necessary sampling equipment is included in the mobilization.

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**QUAIL CREEK LANDFILL  
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**TABLE 4-1**

**ANTICIPATED PROJECT STAFF PERSONNEL**

<b>NAME</b>	<b>TITLE</b>	<b>ROLES</b>	<b>PROJECT RESPONSIBILITIES</b>
Jeff Criner	Project Scientist	Project Team Leader	<ul style="list-style-type: none"> <li>• Project coordination from the WESTON office.</li> </ul>
Troy Hile	Assistant Engineer I	Field Team Leader	<ul style="list-style-type: none"> <li>• TWP field implementation and final sample location selection.</li> <li>• Sampling and safety oversight and quality control.</li> <li>• Logbook documentation and photography.</li> <li>• Public relations and client interactions.</li> <li>• Sample management.</li> </ul>
Dan Johnson	Assistant Engineer II	Site Safety Officer and Assistant Sampler	<ul style="list-style-type: none"> <li>• HASP field implementation.</li> <li>• Health and safety oversight.</li> <li>• Sample collection.</li> <li>• Mobilization/Demobilization.</li> </ul>
Ria Aiken	Assistant Project Scientist	Sampler	<ul style="list-style-type: none"> <li>• Sample collection.</li> <li>• Equipment management.</li> <li>• Sample documentation, packaging, and shipping.</li> <li>• Mobilization/Demobilization.</li> <li>• Air monitoring/monitoring equipment calibration.</li> </ul>
Richard Bost	Assistant Engineer I	Sampler	<ul style="list-style-type: none"> <li>• Sample documentation, packaging, and shipping.</li> <li>• EPA SMO/RSCC coordination.</li> </ul>

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As part of the mobilization effort, the field team will assemble the required sample containers and CLP documentation prior to leaving for the site, as time permits. The sample jars, sample tags, sample numbers and custody seals needed for each sample station will be placed in a 2-gallon, plastic Ziplock bag, which will be sealed and packed in a cooler. The sample station number will be labeled in ink on each 2-gallon bag and on top of each sample container lid.

This process will facilitate sampling efforts once the fieldwork begins. When the required sampling equipment has been loaded, one or two field team members will drive the equipment van to the site. Depending on the distance from WESTON's office to the site, this may be done the day before sampling activities are scheduled or early on the same day. The remaining field team members may drive or fly to the site. The field team generally will meet at its place of lodging, if any, before proceeding to the site. WESTON will inform the EPA Work Assignment Manager (WAM) of the sampling mission and its final schedule before the start date of the fieldwork.

Once at the site, the Field Team Leader (FTL) will meet with the site and EPA representatives, if present. The access agreement should be shown to the site representative to reconfirm site access. A copy of the Consent for Access form signed by the site representative is included as Appendix A.

As part of initial mobilization reconnaissance activities and before going on-site, the WESTON team will drive the route from the site to the nearest hospital.

#### **4.2.2 Task 2 — Health and Safety Meeting and Protocol**

After arriving at the site and checking in with the site representative if one is present, the WESTON FTL and the Site Health and Safety Coordinator (SHSC) will conduct a meeting to review the technical aspects of the project and discuss the site-specific HASP and related WESTON Standard Operating Procedures (SOPs) with the sampling team. The HASP and related SOPs are provided in this TWP as Appendix B. After this meeting, a copy of the HASP, with the map to the hospital on the first page, will be placed on the dashboard of the field vehicle designated for emergency use.

The fieldwork for the SI will be conducted in general accordance with the site-specific HASP. The sampling team generally will work with Level-D personal protective clothing and equipment as specified in the HASP, as long as air-monitoring results justify this level of protection. The monitoring instruments to be used are specified in the HASP. Depending on the air-monitoring results, the sampling team may be required to upgrade to a Level-C personal protection status if one or more of the air monitoring action levels listed in the HASP is met or exceeded.

At the start of each day and as necessary at other times during the sampling visit, the FTL will conduct safety meetings to reiterate site concerns and address any new technical or safety issues.

A designated team member will perform a field calibration check and overall inspection of the monitoring instruments each day prior to sampling.

#### **4.2.3 Task 3 — Initial Sample Location Reconnaissance**

After the safety meeting is conducted, the WESTON FTL will meet with the site representative and any EPA representative present to complete an initial survey of the sample locations indicated in the TWP. This will be done to allow the FTL to become familiar with the area of investigation, verify that sample locations are accessible, and identify potential health and safety concerns at each location. This initial reconnaissance will be conducted from the support zone as much as possible. If entry into a potential exclusion zone area is required for this task, a second WESTON team member will accompany the FTL to perform air monitoring during the reconnaissance.

If a sample location is found to be inaccessible for some reason, alternative sample locations may be chosen in consultation with the WESTON Project Team Leader (PTL). The PTL will communicate alterations in the TWP to the WESTON Site Manager and EPA WAM.

#### **4.2.4 Task 4 — Acquisition of Off-site Access**

Prior to performing sampling activities, the owners of any off-site properties for which sampling has been proposed will be contacted. Unless an EPA representative designated by the WAM to obtain off-site access is present in the field, the WESTON FTL will obtain permission from the owners for WESTON to collect samples from their property. The owners of off-site properties targeted for sampling will be provided with a fact sheet explaining the investigation, if one is available.

If access cannot be obtained at an off-site property targeted for sampling, the WESTON FTL will select an alternate sampling location after consultation with the WESTON PTL, who in turn will notify the EPA WAM of any alterations to the TWP.

#### **4.2.5 Task 5 — Command Post Establishment**

After the safety meeting has been held, the WESTON team will establish a command post in an accessible location at the site in an area generally thought to be unaffected by site operations, if such an area is available. The command post will be located in the support zone, where work may proceed in Level D without continuous air monitoring. Access to the exclusion zone and contaminant reduction zone established around the on-site waste source areas will be controlled through the command post.

The command post will include the following:

- An equipment-staging area where equipment can be prepared for usage,

- A decontamination area (as specified in the HASP, Appendix B) where field personnel and equipment can be decontaminated, and
- A sample management area where samples can be labeled, preserved and packaged.

Sampling activities to be performed in off-site areas, if any, will begin from the on-site command post.

### **4.3 SAMPLING TASKS**

Field tasks 6 through 12 are associated with the collection of samples and are described in the following subsections. Sample locations are shown in Figure 4-1 at the end of this section.

#### **4.3.1 Task 6 - Documentation of Field Activities**

The WESTON FTL will document in a logbook the activities performed during the SI sampling visit, as well as other significant observations made throughout the field investigation. The FTL will keep a chronological log of field activities in the logbook. Additionally, the FTL will take photographs to support the observations documented in the logbook.

The documentation recorded in the logbook for each sample location will include:

- Sample station number,
- Sample location (including the address and the distance and bearing from a fixed reference point),
- Sample description (matrix, color, odor, OVA responses, etc.),
- CLP sample numbers and tag numbers,
- Lot numbers for sample containers,
- Date and time of sample collection, and
- Conditions around the sample location.

#### **4.3.2 Task 7 — Equipment Decontamination**

Prior to sampling, the WESTON field team will decontaminate the sampling equipment, which will come in contact with the samples during sample collection procedures. Equipment decontamination will be performed at the command post. To complete the decontamination process, the equipment will be:

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- Washed in a tub or bucket with a mixture of potable water and Liquinox (or other nonphosphate detergent),
- Rinsed in a bucket with potable water,
- Rinsed with deionized water, and
- Allowed to air-dry.

WESTON will use dedicated sampling equipment, when available, for each sample station to minimize the need for decontamination. WESTON will decontaminate the sampling equipment at the command post before and after use. The amount of rinsate water generated will be kept to a minimum, and the rinsate water generated during the decontamination processes will be collected in a small drum or 5-gallon buckets.

At the end of the field activities, the water will be disposed of at the end of the sampling mission in accordance with Task 15, discussed later in this TWP.

#### **4.3.3 Task 8 — Waste Sampling**

Since there is a creek that crosses through the site, and WESTON does not want to potentially jeopardize the integrity of the landfill cover, no waste source samples from the landfill will be collected. Rather, sediment samples from Mills Branch Creek will be used to verify contamination in the landfill.

All samples will be collected in general accordance with the sampling operating procedures provided in Appendix C.

#### **4.3.4 Task 9 — Soil Sampling**

WESTON does not plan to collect soil samples as part of the sampling activities.

#### **4.3.5 Task 10 — Surface Water and Bottom Sediment Sampling**

WESTON will collect four surface water and six bottom sediment samples as part of the SI to document a release to the surface water pathway.

#### **4.3.6 Task 11 — Groundwater Sampling**

WESTON does not plan to collect groundwater samples as part of the sampling activities.

#### **4.3.7 Task 12 — Sample Management**

WESTON will manage the samples collected during the SI in a manner generally consistent with EPA and EPA CLP guidelines. Specific guidelines are provided in the following subsections. Additional guidelines are provided in Appendix D.

##### **4.3.7.1 Sample Container Decontamination**

When a sample is collected and returned to the command post, the Sample Manager will see that the outside of each container is decontaminated. To decontaminate the sample containers, each sample container will be washed with deionized water and dried with a towel.

##### **4.3.7.2 Sample Documentation**

Each sample will be appropriately documented and identified using the appropriate EPA CLP labels, tags, and forms. The following guidelines will be used:

- Each sample station will receive a set of CLP sample numbers. Samples for organic analysis will receive sample numbers beginning with "F", the inorganic samples will receive sample numbers beginning with "M", and samples for special analyses will receive sample numbers beginning with "S".
- Each bottle or jar for a sample station will receive a sample number sticker, a sample tag, and a custody seal.
- The sample information will be written on the appropriate Traffic Reports/Chain-of-Custody forms, which will remain with the samples.

Additional information regarding sample documentation procedures is included in Appendix D.

##### **4.3.7.3 Sample Packaging**

Once labeling is completed, the Sample Manager and FTL will review the sample documentation for accuracy before the samples are packaged for shipping. Once this quality assurance check is completed, the samples will be packaged in coolers using the following guidelines:

- Each sample bottle or jar will be placed within a Ziplock bag which will be sealed. Additionally, samples that are suspected to be of medium or high concentration will be placed in a paint can that will be sealed.
- Bubble wrap will be placed in the bottom of the coolers to help prevent breakage during subsequent transport.

- The bottles and jars will be placed into coolers. Samples for organic, inorganic, and special analyses will be placed into different coolers as they typically will be going to different laboratories. Samples of a different matrix going to the same laboratory will be packed in different coolers as well.
- Vermiculite will be poured and packed into the spaces around the sample containers to fill void space and help prevent breakage during transport.
- At least two 2-gallon bags filled with ice will be placed on the samples in each cooler (48 quart or larger) to help maintain the ice chest temperature at approximately 4°C. Additional vermiculite may be added on top of the ice to fill the cooler. For shipments not requiring a 48-quart cooler, one 2-gallon bag of ice will be placed on top of the packed sample.
- The appropriate Traffic Report/Chain-of-Custody forms (laboratory copies only) will be sealed inside a 2-gallon plastic bag and taped to the inside of the cooler lid.
- The coolers will then be closed, and they will be sealed with strapping or packing tape and at least two EPA custody seals (on opposite sides of the cooler). Coolers will be left unattended only if they are left in a secured area with custody labels on each cooler.

#### **4.3.7.4 Sample Shipping**

When sampling is completed for a given day, the sampling team will ship the samples by Federal Express Priority Overnight Service (at government rate) to the assigned laboratories for analytical testing. The names and addresses of the laboratories will be provided by EPA by the Friday prior to the week that sampling activities are scheduled. After shipping the samples, the Sample Manager will contact the EPA Sample Management Office (SMO) with information concerning the shipment.

#### **4.3.8 Task 13 — Sample Receipt Form Completion**

Following sampling activities at the site or at off-site locations, the WESTON FTL will provide an EPA Receipt of Samples form to the representatives of the property sampled. The property representatives need to sign these forms, and the FTL should provide the property owners with a carbon copy of the signed form. These forms will identify the date, location and type of each sample collected. The forms will be forwarded to EPA as part of the final SI report. An example Receipt of Samples form is included in Appendix D.

#### **4.4 DEMOBILIZATION AND OTHER ACTIVITIES**

The remaining tasks will be completed by the field team after all samples are collected and shipped and after the FTL acquires the consent of the WESTON PTL or Site Manager.

##### **4.4.1 Task 14 — Demobilization**

Following the completion of all sampling activities, the field team will decontaminate, package, and transfer all nondisposable sampling equipment back to the WESTON RES warehouse in Houston, Texas. The command post and decontamination areas will also be dismantled. WESTON will, as possible, leave the site in the same condition it was prior to the investigation.

##### **4.4.2 Task 15 — Decontamination Rinsate Water Disposal or Staging**

After completing sampling activities, the FTL will request permission from the site representative, if present, to dispose of the decontamination rinsate water in a known or suspected HWSA at the site. If permission is granted, the water will be disposed of on-site. If the site representative is not present during the fieldwork and the site is inactive and abandoned, WESTON generally will dispose of the water onsite unless the site representative has previously objected to this practice. The WESTON PTL will inform the site representative of WESTON's intent to dispose of the rinsate water on-site when notified of the dates of the sampling visit.

If the site representative will not grant permission for on-site rinsate water disposal, the rinsate water will be transferred to a small drum. The rinsate water will be sampled using protocol similar to that used for surface water sampling. The drum of water then will be sealed with EPA custody tape, labeled, and staged in an area of the site designated by the site representative. The rinsate water sample will be sent to an EPA-designated laboratory.

##### **4.4.3 Task 16 — Background Information Acquisition**

While in the field, the WESTON FTL and other designated personnel may collect background information needed to close project data gaps, as time allows. Activities may include visiting city offices to collect local agency file information and to obtain maps, locating water wells in the area, or driving along the surface water pathway to visually document fisheries and wetlands. Background research tasks will be assigned to the FTL by the PTL once sampling activities are completed. In general, only one or two of the field team members will be assigned background research tasks if time allows.

#### **4.5 COMMUNITY RELATIONS**

Persons requesting site information from the WESTON field team will be instructed to submit a Freedom of Information Act Request to Freedom of Information Officer, U.S. EPA Region VI, 1445 Ross Avenue, Dallas, Texas 75202-2733. Reporters will be instructed to contact EPA's Office of External Affairs at (214) 655-2200 or the EPA representative in the field if one is

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present. The WESTON FTL will notify the WESTON PTL or Site Manager immediately if reporters are present at the site. The WESTON personnel in the office, in turn, will notify the EPA WAM.

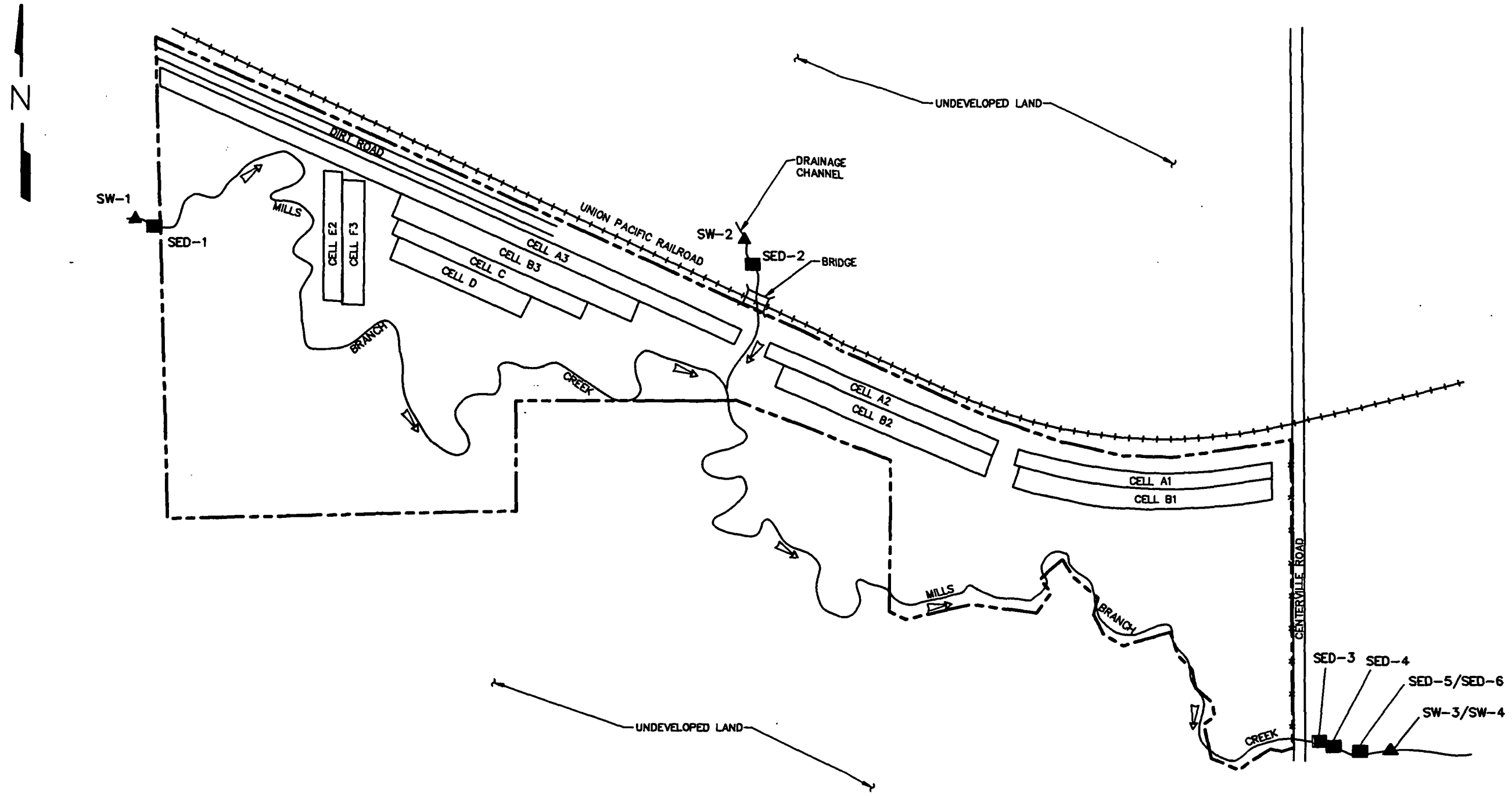
#### **4.6     FIELD FOLLOW-UP MEMORANDUM**

As stated in WESTON's Generic Site Inspection Work Plan (Document Control No. 4603-23-0008) dated 15 August 1991, WESTON will submit a memorandum to the WAM describing any alterations that were made to the TWP in the field. This memorandum will also serve to notify the WAM of any conditions observed at the site that appeared to represent an imminent threat.

#### **4.7     REPORT PREPARATION**

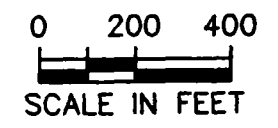
After receiving analytical data for the site from EPA, WESTON will prepare the final report for the SI. The report will contain information as specified in WESTON's Generic Site Inspection Work Plan and in regional guidance. The report format will include the following sections:

- An introduction describing the background and purpose of the investigation;
- A site characteristics section describing the site location, description operating history, source waste characteristics, and site concerns;
- A sampling activities section discussing the field activities completed during the SI,
- Individual sections for the groundwater, surface water, soil exposure, and air pathways, describing the environmental conditions at the site, the likelihood of a release, and targets; Analytical data will be summarized in these sections;
- A summary and conclusions section discussing the major site concerns;
- A reference list; and
- Appendices containing photographs and reference materials.



**LEGEND:**

- PROPERTY BOUNDARY
- ▷ FLOW DIRECTION
- ++++ RAILROAD
- x-x-x- FENCE
- SEDIMENT SAMPLE LOCATION
- ▲ SURFACE WATER SAMPLE LOCATION



**FIGURE 4-1**  
EPA REGION 6  
ARCS SITE INSPECTIONS  
SAMPLE LOCATION MAP

QUAIL CREEK LANDFILL  
GARLAND, DALLAS COUNTY, TEXAS  
CERCLA ID. NO. : TXD980697205

W.O. NO. : 04603-023-027-2100

**SITE INSPECTION  
TASK WORK PLAN**

**QUAIL CREEK LANDFILL  
GARLAND, DALLAS COUNTY, TEXAS  
EPA CERCLA ID NO.: TXD980697205**

**TABLE 4-2  
SAMPLE LOCATION, DESCRIPTION, AND RATIONALE SUMMARY**

<b>STATION NUMBER</b>	<b>SAMPLE DESCRIPTION AND LOCATION*</b>	<b>RATIONALE</b>
SED-1	Low-concentration sample collected upstream of the site along Mills Branch Creek.	Sample collected to document background concentrations.
SED-2	Low-concentration sample collected approximately 100 feet north of the northern property boundary within the drainage channel.	Sample collected to characterize waste in the landfill and to document contamination in the surface water pathway.
SED-3	Low-concentration sample collected approximately 50 feet east of Centerville Road within the Mills Branch Creek.	Sample collected to characterize waste in the landfill and to document contamination in the surface water pathway.
SED-4	Low-concentration sample collected approximately 100 feet east of Centerville Road within the Mills Branch Creek downstream of SED-3.	Sample collected to characterize waste in the landfill and to document contamination in the surface water pathway.
SED-5	Low-concentration sample collected approximately 200 feet east of Centerville Road within the Mills Branch Creek downstream of SED-4.	Sample collected to characterize waste in the landfill and to document contamination in the surface water pathway.
SED-6	Low-concentration sample collected from sample location SED-5.	Sample collected to characterize waste in the landfill and to document contamination in the surface water pathway.
SW-1	Low-concentration surface water sample collected from Mills Branch Creek upstream of the site.	Sample collected to document background concentrations.
SW-2	Low-concentration surface water sample collected approximately 100 feet north of the northern property boundary within the	Sample collected to document contamination in the surface water pathway.

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**SITE INSPECTION  
TASK WORK PLAN**

**QUAIL CREEK LANDFILL  
GARLAND, DALLAS COUNTY, TEXAS  
EPA CERCLA ID NO.: TXD980697205**

**TABLE 4-2  
SAMPLE LOCATION, DESCRIPTION, AND RATIONALE SUMMARY  
(continued)**

<b>STATION NUMBER</b>	<b>SAMPLE DESCRIPTION AND LOCATION*</b>	<b>RATIONALE</b>
	drainage channel.	
SW-3	Low-concentration surface water sample collected approximately 200 feet east of Centerville Road within the Mills Branch Creek.	Sample collected to document contamination in the surface water pathway.
SW-4	Low-concentration surface water sample collected from sample location SW-3.	Sample collected to document contamination in the surface water pathway.

\* Refer to Figure 4-1 for the proposed sample locations.



**SITE INSPECTION  
TASK WORK PLAN**

**QUAIL CREEK LANDFILL  
GARLAND, DALLAS COUNTY, TEXAS  
EPA CERCLA ID NO.: TXD980697205**

**TABLE 4-3  
SAMPLING INFORMATION**

<b>SAMPLING INFORMATION</b>			
<b>SAMPLE TYPE</b>	<b>NUMBER AND TYPE OF CONTAINERS REQUIRED PER SAMPLE</b>	<b>ANALYSES REQUIRED</b>	<b>SAMPLE PRESERVATION REQUIRED</b>
Soil/Sediment Samples	Two 4-oz. glass jars One 8-oz. glass jar One 8-oz. glass jar	Volatiles BNAs/Pesticides/PCBs Metals/Cyanide	Cool to 4°C Cool to 4°C Cool to 4°C
Surface Water Samples	Two 40-mL glass vials Four 1-L glass bottles One 1-L plastic bottle One 1-L plastic bottle	Volatiles BNAs Pesticides/PCBs Total Metals Cyanide	Cool to 4°C Cool to 4°C Cool to 4°C Add HNO <sub>3</sub> and Cool to 4°C Add NaOH and Cool to 4°C

- \* For the surface water sample collected during the SI, more samples will be collected to provide extra volume for laboratory matrix spike and matrix spike duplicate preparation. Triple the above-listed volume will be collected for organic analyses, and double the above-listed volume will be collected for inorganic analyses.

## SECTION 5 PROJECT INFORMATION

This section outlines basic project management information for the SI. Details concerning key personnel and the project schedule are provided. Reference should be made to WESTON's Generic Site Inspection Work Plan (WESTON Document Control No. 4603-23-0008) for more detailed information concerning WESTON's project management plan.

### 5.1 KEY PROJECT PERSONNEL

The anticipated key project personnel for this SI assignment are shown on Figure 5-1.

### 5.2 PROJECT SCHEDULE

The overall project schedule is summarized in Table 5-1.

### 5.3 SAMPLING VISIT SCHEDULE

#### Sunday

8:00 p.m.	Team members arrive in Garland. Health and safety meeting.
-----------	---

#### Monday

8:00 a.m.	Team arrives at site and FTL meets with site contact. Samplers establish command post. FTL and Sample Manager prepare sample tags and labels.
9:00 a.m. - 12:00 p.m.	Team collects surface water and sediment samples. Sample Manager documents samples.
12:00 p.m. - 12:45 p.m.	Lunch.
1:00 p.m. - 4:00 p.m.	Label, log, and check sample bottles; complete and check traffic reports; pack samples into appropriate coolers.
4:00 p.m. - 5:00 p.m.	FTL and Sample Manager depart for Federal Express to ship samples. Samplers decontaminate and load equipment and depart the site for the day.

## Tuesday

8:00 a.m.	Team arrives at site and holds brief safety meeting. FTL and Sample Manager prepare sample tags and labels.
9:00 a.m. - 12:00 p.m.	Team collects the remainder of the sediment samples. Sample Manager documents samples.
12:00 p.m. - 12:45 p.m.	Lunch.
1:00 p.m. - 4:00 p.m.	Label, log, and check sample bottles; complete and check traffic reports; pack samples into appropriate coolers; demobilize from site.
4:00 p.m. - 5:00 p.m.	FTL and Sample Manager depart for Federal Express to ship samples. Samplers decontaminate and load equipment and depart the site for the day.

## Wednesday

8:00 am	Team arrives at site and holds a brief safety meeting. FTL and Sample Manager prepare sample tags and labels.
9:00 am - 12:00 p.m.	Team collects groundwater samples.
12:00 p.m. - 1:00 p.m.	Lunch.
1:00 p.m. - 3:00 p.m.	Team collects the remainder of the groundwater samples.
3:00 p.m. - 4:00 p.m.	Label, log, and check sample bottles; complete and check traffic reports; pack samples into appropriate coolers; demobilize from site.
4:00 p.m. - 5:00 p.m.	FTL and Sample Manager depart for Federal Express to ship samples. Samplers decontaminate and load equipment and depart the site.

## **5.4 IMPORTANT PHONE NUMBERS**

Important phone numbers that may be needed by the FTL include the following:

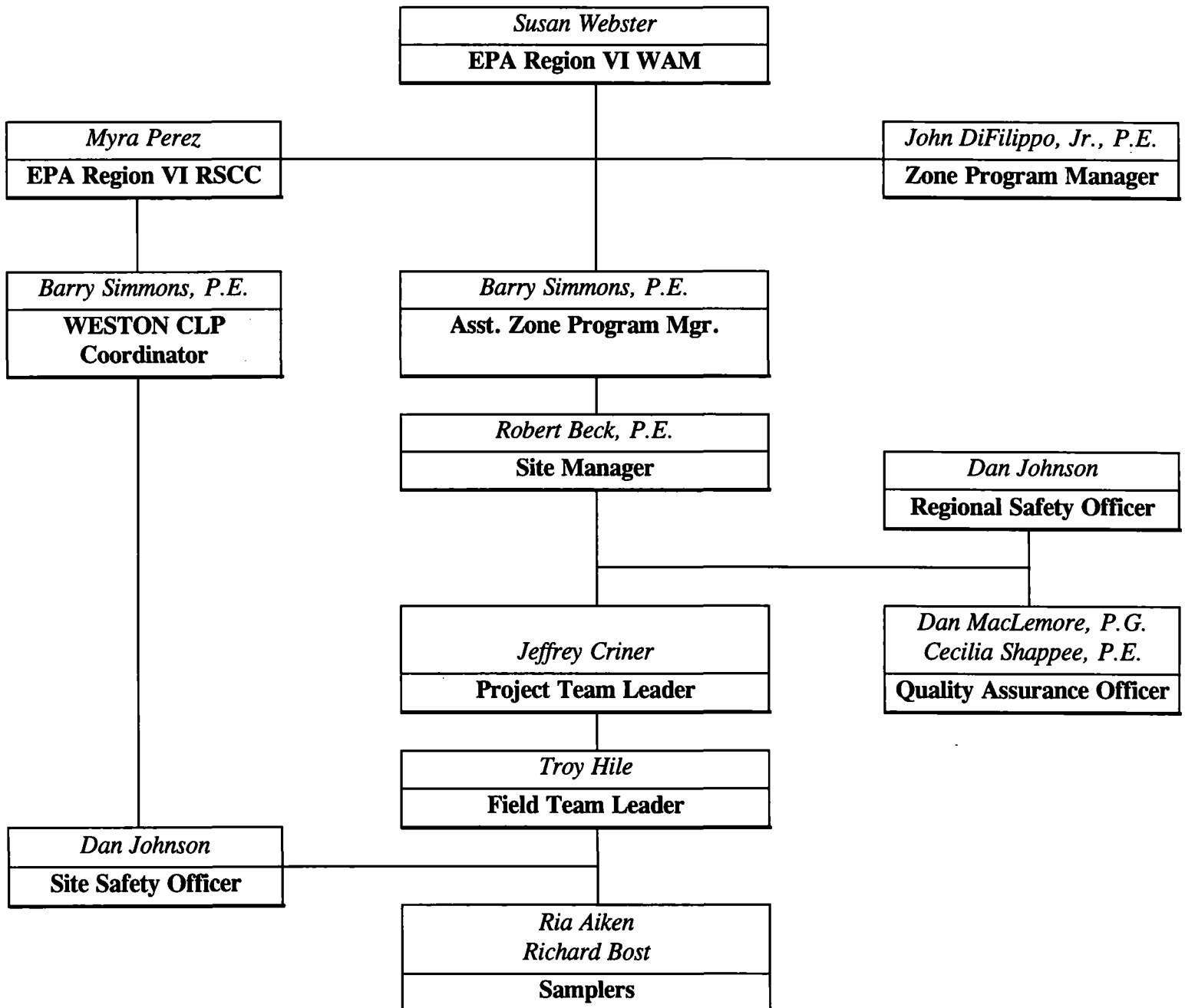
- Local Hospital: 1-214-276-7116
- WESTON 24-hr Emergency: 1-800-229-3674
- WESTON Office: (210) 342-7810

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- WESTON RES: (713) 957-3267
- EPA WAM (Susan Webster): (214) 655-8374
- EPA RSCC (Christy McDowell): (713) 983-2130/(713) 983-2137
- EPA (SMO-Nina Kuchar): (703) 519-1360 (Alternate Number: (703) 557-2490)
- Place of Lodging in Field: To be determined
- Federal Express (National): 1-800-238-5355
- Federal Express (Local Office): To be determined

**FIGURE 5-1  
ANTICIPATED PROJECT TEAM ORGANIZATION**



**SITE INSPECTION  
TASK WORK PLAN**

**QUAIL CREEK LANDFILL  
GARLAND, DALLAS COUNTY, TEXAS  
EPA CERCLA ID NO.: TXD980697205**

**TABLE 5-1**

**PROJECT SCHEDULE  
(1996 - 1997)**

TARGET MILESTONES	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
WORK PLAN SUBMITTAL TO EPA												
WORK PLAN APPROVAL BY EPA												
LABORATORY SPACE REQUEST												
EQUIPMENT MOBILIZATION												
FIELD SAMPLING VISIT												
DATA ANALYSIS BY EPA LAB/CLP LAB												
DATA VALIDATION BY EPA												
REPORT WRITING												
REPORT QUALITY ASSURANCE												
REPORT SUBMISSION												

**APPENDIX A**  
**SITE ACCESS AGREEMENT**

**APPENDIX B**

**HEALTH AND SAFETY PLAN**



# SITE HEALTH AND SAFETY PLAN (HASP)

Prepared by: Billy Cress

Date: <sup>3</sup> ~~9 November 1994~~

W.O. Number: 04603-023-027-2100-03

## Project Identification:

Division: WESTON/Southcentral Region  
Department/Office: 001010/San Antonio, Texas  
Site Name: Quail Creek Landfill  
Client: EPA Region VI/ARCS Dallas, Texas  
Work Location Address: Garland, Texas

**Site History:** The Quail Creek Landfill site (TXD980697205) is an inactive landfill located in Garland, Dallas County, Texas. There is no record of hazardous waste being introduced to the site.

**Scope of Work:** The scope of work for the project includes on-site and off-site reconnaissance; on-site and off-site sampling of one or more of the following: soil, surface water, groundwater, sediments, waste sources.

☐ Site visit only; site HASP not necessary. List personnel here and sign off below:

## Regulatory Status:

### Site regulatory status:

CERCLA/SARA	RCRA	Other Federal Agency
<input checked="" type="checkbox"/> US EPA	<input type="checkbox"/> US EPA	<input type="checkbox"/> DOE
<input type="checkbox"/> State	<input type="checkbox"/> State	<input type="checkbox"/> USATHAMA
<input type="checkbox"/> NPL Site		<input type="checkbox"/> Air Force
OSHA	NRC	
<input checked="" type="checkbox"/> 1910	<input type="checkbox"/> 10 CFR 20	
<input type="checkbox"/> 1926		
<input type="checkbox"/> State		

Based on the Hazard Assessment and Regulatory Status, determine the Standard HASP(s) applicable to this project. Indicate below which Standard HASP will be used and append the appropriate pages of this form along with the Standard Plan.

<input type="checkbox"/> Stack Test	<input type="checkbox"/> _____
<input type="checkbox"/> Air Emissions	<input type="checkbox"/> _____
<input type="checkbox"/> Asbestos	<input type="checkbox"/> _____
<input type="checkbox"/> Industrial Hygiene	<input type="checkbox"/> _____
<input checked="" type="checkbox"/> Hazardous Material	<input type="checkbox"/> _____

## Review and Approval Documentation:

### Reviewed by:

a. P.M. *LothBB-L*  
b. P.D.  
c. DSO/RSO *Pam Quachnel*  
d. SHSC *JEFF CIZINOR* / *Jeff C*

Date: 1/27/95  
Date:  
Date: 2/2/95  
Date: 1/24/95

### Approved by:

*[Signature]*  
☒ Corporate Health and Safety Director (CHSD)  
☐ DSO/RSO (Only with specific delegation by CHSD)

Date: 2/9/95

Project start date: 1/24/95  
End date: 5/28/95  
7/24/95  
12/31/96

This site HASP must be reissued/reapproved for any activities conducted after:  
5/28/95  
7/24/95

Amendment date(s):  
1. *BB* thru 12/31/96  
2.  
3.  
4.  
5.

By:

**WESTON REPRESENTATIVE**

Organization/Branch	Name/Title	Address	Telephone
WESTON/San Antonio	Robert B. Beck/Site Manager	70 NE Loop 410, Suite 460 San Antonio, Texas 78216	(210)342-7810
WESTON/Houston	Barry Simmons/Asst. Zone Program Manager	5599 San Felipe, Suite 700 Houston, Texas 77056	(713)621-1620
WESTON/Houston	Jeff Criner/Project Team Leader	70 NE Loop 410, Suite 460 San Antonio, Texas 78216	(210)342-7810

**Roles and Responsibilities:** The Site Manager is responsible for project management of the Site Inspection (SI) Work Assignment. The Assistant Zone Program Manager oversees all ARCS work assignments including the SIs. The Project Team Leader (PTL) is responsible for completion of technical activities associated with the site.

**WESTON SUBCONTRACTORS**

Organization/Branch	Name/Title	Address	Telephone
N/A			

**Roles and Responsibilities:**

**SITE SPECIFIC HEALTH AND SAFETY PERSONNEL**

The Site Health and Safety Coordinator (SHSC) for activities to be conducted at this site is: ~~Jeff Criner~~

The SHSC has total responsibility for ensuring that the provisions of this Site HASP are adequate and implemented in the field.

Changing field conditions may require decisions to be made concerning adequate protection programs. Therefore, the personnel assigned as SHSCs are experienced and meet the additional training requirements specified by OSHA in 29 CFR 1910.120

**Qualifications:** The SHSC designated for this site assessment will have OSHA 40-hour training and current refresher training as applicable. The SHSC will have completed the WESTON SHSC training course. He will have current First Aid and CPR, blood borne pathogen, and dangerous goods shipping training. He will have completed the appropriate amount of field work in the level of protection with WESTON for which he is to be SHSC, he will be participating in the WESTON medical monitoring program and have a current medical, and he will meet the approval of the Regional Safety Officer as SHSC.

**Designated alternates include:** The field personnel listed on page <sup>31</sup> that meet training requirements for SHSC who are selected by the Project Team Leader and approved by the Regional Safety Officer to be ~~designated~~ alternative SHSCs. An asterisk appears after their name of the personnel listed on page <sup>31</sup> who are eligible for this role. ~~designated~~

# HEALTH AND SAFETY EVALUATION

## Hazard Assessment

**Background Review:** ☐ Complete ☒ Partial If partial why? The hazardous assessment is partially complete because the contaminant source areas on-site and contaminant migration have not been fully characterized. The purpose of this project is to assess site hazards through reconnaissance and sampling. The HASP will be amended to include hazards noted during site reconnaissance if necessary.

### Activities Covered Under This Plan:

No.	Task/Subtask	Description	Schedule
1	Site Reconnaissance	Site Recon Walk Through	12/20/94 (est.)
2	2a	Soil Sampling	TBD
	2b	Groundwater Sampling	TBD
	2c	Sediment Sampling	TBD
	2d	Surface Water Sampling	TBD
	2e	Water Source Sampling	TBD

### Types of Hazards:

☐ Numbers refer to one of the following hazard evaluation forms. Complete hazard evaluation forms for each appropriate hazard class.

<b>Physiochemical <sup>1</sup></b>  <input checked="" type="checkbox"/> Flammable <input type="checkbox"/> Explosive <input type="checkbox"/> Corrosive <input type="checkbox"/> Reactive <input type="checkbox"/> O <sub>2</sub> Rich <input type="checkbox"/> O <sub>2</sub> Deficient	<b>Chemically Toxic <sup>1</sup></b>  <input checked="" type="checkbox"/> Inhalation <input checked="" type="checkbox"/> Carcinogen <input checked="" type="checkbox"/> Ingestion <input type="checkbox"/> Mutagen <input checked="" type="checkbox"/> Contact <input type="checkbox"/> Teratogen <input checked="" type="checkbox"/> Absorption <input checked="" type="checkbox"/> OSHA 1910.1000 Substance Vinyl Chloride, benzene  <input checked="" type="checkbox"/> OSHA Specific Hazard Sub. Standard Describe: Benzene (suspected), Vinyl Chloride (suspected)	<b>Radiation <sup>3</sup></b>  Ionizing: <input type="checkbox"/> Internal exposure <input checked="" type="checkbox"/> External exposure  Non-ionizing: <input type="checkbox"/> UV <input type="checkbox"/> IR <input type="checkbox"/> RF <input type="checkbox"/> MicroW <input type="checkbox"/> Laser	<b>Biological <sup>2</sup></b>  <input type="checkbox"/> Etiological Agent <input checked="" type="checkbox"/> Other (Plant, insect, animal)  <input checked="" type="checkbox"/> Physical Hazards <sup>4</sup> <input type="checkbox"/> Construction Activities
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### Source/Location of Contaminants and Hazardous Substances

<b>Directly Related to Tasks</b>  <input checked="" type="checkbox"/> Air <input checked="" type="checkbox"/> Other Surface <input checked="" type="checkbox"/> Groundwater <input checked="" type="checkbox"/> Soil <input checked="" type="checkbox"/> Surface Water <input checked="" type="checkbox"/> Other Sediments Waste Source Materials	<b>Indirectly Related to Tasks - Nearby Process(es) That Could Affect Team Members:</b>  <input checked="" type="checkbox"/> Client Facility <input type="checkbox"/> Nearby Non-client Facility  Describe: Nearby process(es) which could affect team members: none are known, but they are possible. This will be determined during site reconnaissance efforts. The HASP will be amended at the bottom of this page by the SHSC in consultation with the RSO after the site reconnaissance if necessary. Nearby process areas that are not part of the site investigation will not be approached.  <input type="checkbox"/> Client Briefing Arranged In accordance with the scope of work, a client briefing will not be arranged before site reconnaissance is performed. Subsequently, a briefing may be held with EPA to identify imminent threats associated with the site, if any.
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# HEALTH AND SAFETY EVALUATION - ☒ CHEMICAL HAZARDS

☐ N/A

## Chemical Contaminants of Concern

Provide the data requested for chemical contaminants on HASP Form 33HASP.394 or attach data sheets from an acceptable sources such as NIOSH pocket guide, condensed chemical dictionary, ACGIH TLV booklet, etc. List chemical and concentration below and locate data sheets in Appendix A of this HASP.

☐ N/A

Identify hazardous materials used or on-site and attach Material Safety Data Sheets for all reagent type chemicals, solutions, or other identified materials that in normal use in performing tasks related to this project could produce hazardous substances. Ensure that all subcontractors and other parties working nearby are informed of the presence of these chemicals and the location of MSDS's. Obtain from subcontractors and other parties lists of the hazardous materials they use or have on-site and identify location of MSDS's here. List chemicals and quantities below and locate MSDS in Appendix B of this HASP.

Chemical Name	Concentration (if known)	Chemical Name	Quantity
Benzene (Suspected site contaminant) Toluene (Suspected site contaminant) Xylene (Suspected site contaminant) Ethylbenzene (Suspected site contaminant) Methane (Suspected site contaminant) Vinyl Chloride (Suspected site contaminant)		NaOH Sample (Preservative) HNO <sub>3</sub> Sample (Preservative and decontamination agent) HCl Sample (Preservative) Ethanol (Decontamination agent)	

# HEALTH AND SAFETY EVALUATION - 2 BIOLOGICAL HAZARDS OF CONCERN

## ☒ Poisonous Plants

Location/Task No(s): All

Source: ☐ Known ☒ Suspect

Route of Exposure: ☐ Inhalation ☐ Ingestion  
☒ Contact ☐ Direct Penetration

Team Member(s) Allergic: ☐ Yes ☒ No

Immunization required: ☐ Yes ☒ No

## ☒ Insects

Location/Task No(s): All

Source: ☐ Known ☒ Suspect

Route of Exposure: ☐ Inhalation ☐ Ingestion  
☐ Contact ☒ Direct Penetration

Team Member(s) Allergic: ☐ Yes ☒ No

Immunization required: ☐ Yes ☒ No

## ☒ Snakes, Reptiles

Location/Task No(s): All

Source: ☐ Known ☒ Suspect

Route of Exposure: ☐ Inhalation ☐ Ingestion  
☐ Contact ☒ Direct Penetration

Team Member(s) Allergic: ☐ Yes ☒ No

Immunization required: ☐ Yes ☒ No

## ☒ Animals

Location/Task No(s): All

Source: ☐ Known ☒ Suspect

Route of Exposure: ☐ Inhalation ☐ Ingestion  
☐ Contact ☒ Direct Penetration

Team Member(s) Allergic: ☐ Yes ☒ No

Immunization required: ☐ Yes ☒ No

## ☐ Sewage

Location/Task No(s):

Source: ☐ Known ☐ Suspect

Route of Exposure: ☐ Inhalation ☐ Ingestion  
☐ Contact ☐ Direct Penetration

Team Member(s) Allergic: ☐ Yes ☐ No

Immunization required: ☐ Yes ☐ No

## ☐ Etiologic Agents (List)

Location/Task No(s):

Source: ☐ Known ☐ Suspect

Route of Exposure: ☐ Inhalation ☐ Ingestion  
☐ Contact ☐ Direct Penetration

Team Member(s) Allergic: ☐ Yes ☐ No

Immunization required: ☐ Yes ☐ No

[illegible]

# HEALTH AND SAFETY EVALUATION - 4 PHYSICAL HAZARDS OF CONCERN

OP(s) Attached	Physical Hazard Conditions	Physical Hazard (Add or delete physical hazards)	Weston OP Titles
<input type="checkbox"/>	Loud intermittent or continuous noise.	Physiological distress, hearing loss, disruption of communication	FLD01 - Noise Protection
<input checked="" type="checkbox"/>	Ambient heat stress	Heat rash, heat cramps, heat exhaustion, heat stroke	FLD05 - Heat Stress Prevention and Monitoring
<input type="checkbox"/>	Steam heat stress	Thermal burns, displaced oxygen, and wet working surfaces	FLD03 - Hot Process - Steam
<input type="checkbox"/>	LT3 and Incinerator Heat Stress	Thermal burns from hot surfaces, hot hydraulic line fluids, low pressure steam	FLD04 - Hot Process - Low Temper Thermal and Transportable Incinera
<input checked="" type="checkbox"/>	Cold Stress	Hypothermia, frostbite	FLD06 - Cold Stress
<input checked="" type="checkbox"/>	Inclement weather	Rain, wet weather, high humidity, cold, ice, snow, lightning	FLD02 - Inclement Weather
<input checked="" type="checkbox"/>	Cold/wet	Trench foot, paddy foot, immersion foot, edema	FLD07 - Wet Feet
<input type="checkbox"/>	Confined spaces	Asphyxiation, falls, burns, drowning, engulfment, toxic exposure, electrocution	FLD08 - Confined Space Entry
<input type="checkbox"/>	Explosive vapors and ignition source	Thermal burns, impaction, dismemberment	FLD09 - Hot Work
<input checked="" type="checkbox"/>	Improper lifting	Cuts, pinches, crushing, back strain, abdomen, arm, leg muscle, and joint injury	FLD10 - Manual Lifting/Handling of Heavy Objects
<input checked="" type="checkbox"/>	Uneven walking and driving surfaces	Vehicle accidents, slips, trips, and falls	FLD11 - Rough Terrain
<input type="checkbox"/>	Poor housekeeping	Slips, trips, falls, punctures, cuts and fires	FLD12 - Housekeeping
<input type="checkbox"/>	Structural integrity	Crushing, overhead hazards, compromised floors	FLD13 - Structural Integrity
<input checked="" type="checkbox"/>	Hostile persons	Bodily injury	FLD14 - Site Security
<input checked="" type="checkbox"/>	Remote Area	Slips, trips and falls, back strain, communication	FLD15 - Remote Area
<input checked="" type="checkbox"/>	Improper cylinder handling	Mechanical injury, fire, explosion and suffocation	FLD16 - Pressure Systems - Compressed
<input type="checkbox"/>	Water Hazards	Poor visibility, entanglement, drowning, cold stress	FLD17 - Diving
<input type="checkbox"/>	Water Hazards	Drowning, back stress, heat stress, cold stress, hypothermia, falling	FLD18 - Operation and Use of Boat
<input type="checkbox"/>	Water Hazards	Drowning, frostbite, hypothermia, falls, electrocution	FLD19 - Working Over Water
<input type="checkbox"/>	Vehicle Hazards	Struck by vehicle, collision	FLD20 - Traffic
<input type="checkbox"/>	Explosions	Explosion, fire, thermal burns	FLD21 - Explosives
<input type="checkbox"/>	Moving mechanical parts	Crushing, pinch points, overhead hazards, electrocution	FLD22 - Heavy Equipment Operatio
<input type="checkbox"/>	Moving mechanical parts	Overhead hazard, electrocution	FLD23 - Cranes/Lifting Equipment Operation
<input type="checkbox"/>	Working at elevation	Overhead hazards, falls, electrocution	FLD24 - Aerial Lifts/Manlifts
<input type="checkbox"/>	Working at elevation	Overhead hazard, falls, electrocution	FLD25 - Working at Elevation
<input type="checkbox"/>	Working at elevation	Overhead hazard, falls, electrocution, slips	FLD26 - Ladders
<input type="checkbox"/>	Working at elevation	Slips, trips and falls, overhead hazards	FLD27 - Scaffolding
<input type="checkbox"/>	Trench Cave-in	Crushing, falling, overhead hazard, suffocation	FLD28 - Excavating/Trenching
<input type="checkbox"/>	Improper material handling	Back injury, crushing from load shifts	FLD29 - Materials Handling
<input checked="" type="checkbox"/>	Physiochemical	Explosions, fires from oxidizing, flammable and corrosive materials	FLD30 - Hazardous Materials Use a Storage
<input type="checkbox"/>	Physiochemical	Fire and explosion	FLD31 - Fire Prevention/Response P Required
<input checked="" type="checkbox"/>	Physiochemical	Fire	FLD32 - Fire Extinguishers Required
<input type="checkbox"/>	Structural integrity	Overhead, electrocution, slips, trips, falls, fire	FLD33 - Demolition
<input type="checkbox"/>	Electrical	Electrocution, shock, thermal burns	FLD34 - Utilities
<input type="checkbox"/>	Electrical	Electrocution, shock, thermal burns	FLD35 - Electrical Safety
<input type="checkbox"/>	Impact/thermal	Thermal burn, high pressure impaction, heat stress	FLD37 - High Pressure Washers
<input checked="" type="checkbox"/>	Impaction/electrical	Smashing body parts, pinching, cuts, electrocution	FLD38 - Hand Tools and Power Too
<input type="checkbox"/>	Poor visibility	Slips, trips, falls	FLD39 - Illumination
<input type="checkbox"/>	Fire/Explosion	Thermal burns, impaction, pressurized or energized lines	FLD40 - Storage Tank Removal and Decommissioning
<input type="checkbox"/>	Drilling hazards	Electrocution, overhead hazards, pinch points, decapitation, noise	2.5 - Drilling Safety Guide

# **TASK-BY-TASK RISK ASSESSMENT** (Complete One Sheet for Each Task)

## **TASK DESCRIPTION**

### **TASK 1 - SITE RECONNAISSANCE**

Members of the Project Team will perform a site walk through survey of the site. No intrusive activities will take place.

## **EQUIPMENT REQUIRED/USED**

(Be specific, e.g., hand tools, heavy equipment, instruments, PPE)

MicroR (waist level)  
FID-OVA (breathing zone)  
GMC-H APR Cartridges  
Respirator (full face)

Vinyl chloride, benzene detector tube/Drager pump (S)  
miniRAM (P)

## **POTENTIAL HAZARDS/RISKS**

### **CHEMICAL**

☐ Hazard Present      Risk Level: ☐ H ☐ M ☒ L

What Justifies Risk Level? No known hazards suspected.

### **PHYSICAL**

☐ Hazard Present      Risk Level: ☐ H ☐ M ☒ L

What Justifies Risk Level? No known hazards suspected.

### **BIOLOGICAL**

☐ Hazard Present      Risk Level: ☐ H ☐ M ☒ L

What Justifies Risk Level? No known hazards suspected.

### **RADIOLOGICAL**

☐ Hazard Present      Risk Level: ☐ H ☐ M ☒ L

What Justifies Risk Level? No known hazards suspected.

## **LEVELS OF PROTECTION/JUSTIFICATION**

Initial level of protection will be Level D because no air pathway hazards are known or suspected in the breathing zone. PPE will be worn by WESTON personnel to eliminate possibility of direct contact. If elevated monitoring instrument reading are observed the team will withdraw to the support zone immediately and upgrade appropriately to complete the work (see page 17). Work will not be performed in Level B PPE unless this HASP is amended.

## **SAFETY PROCEDURES REQUIRED AND/OR FIELD OPS UTILIZED**

An initial air monitoring effort will be made at sample locations to determine if upgrades in the level of protection are needed. See Page 17 for action level upgrade. The team will monitor the breathing zone with vinyl chloride/benzene detector/drager pump. The presence of vinyl chloride above 0.5 ppm reading on vinyl chloride Drager tube and/or any register of Benzene on Benzene Drager tube requires evacuation of the area. Unless a miniRAM and appropriate action levels are specified, work will stop if there is visible dust in the air. The reconnaissance team will return to the support zone, upgrade to Level C with GMC-H APR cartridges, and continue work in Level C until the dust is no longer visually apparent.



# **TASK-BY-TASK RISK ASSESSMENT** (Complete One Sheet for Each Task)

## **TASK DESCRIPTION**

### **TASK 2A - SOIL SAMPLING**

Members of the Project Team will collect soil samples from onsite, and potentially offsite locations. Soil samples generally will be collected from 0 to 2 feet.

## **EQUIPMENT REQUIRED/USED**

(Be specific, e.g., hand tools, heavy equipment, instruments, PPE)

FID-OVA (breathing zone)  
miniRAM  
Shovels  
Hand augers  
Disposable plastic scoops

Vinyl Chloride/Benzene Drager tubes / Drager pump  
GMC-11 APR cartridges  
Full face respirator

## **POTENTIAL HAZARDS/RISKS**

### **CHEMICAL**

☐ Hazard Present      Risk Level: ☐ H ☐ M ☒ L

What Justifies Risk Level? No known hazards suspected.

### **PHYSICAL**

☐ Hazard Present      Risk Level: ☐ H ☐ M ☒ L

What Justifies Risk Level? No known hazards suspected.

### **BIOLOGICAL**

☐ Hazard Present      Risk Level: ☐ H ☐ M ☒ L

What Justifies Risk Level? No known hazards suspected.

### **RADIOLOGICAL**

☐ Hazard Present      Risk Level: ☐ H ☐ M ☒ L

What Justifies Risk Level? No known hazards suspected.

## **LEVELS OF PROTECTION/JUSTIFICATION**

Initial level of protection will be Level D (modified) if justified by initial air monitoring at the sample locations.

## **SAFETY PROCEDURES REQUIRED AND/OR FIELD OPS UTILIZED**

Soils will be moistened if visible particulates are noted in the air around the samplers. See Page 17 for action level upgrade. Vinyl Chloride/Benzene Drager tube monitoring applies (see Task 1).

# **TASK-BY-TASK RISK ASSESSMENT** (Complete One Sheet for Each Task)

## **TASK DESCRIPTION**

### **TASK 2B - GROUNDWATER SAMPLING**

Members of the Sampling Team will collect groundwater samples from onsite, and, potentially, offsite locations. Onsite samples will be obtained from monitoring wells. Offsite samples will be obtained from monitoring wells, drinking water wells, or domestic taps.

## **EQUIPMENT REQUIRED/USED**

(Be specific, e.g., hand tools, heavy equipment, instruments, PPE)

FID-OVA (breathing zone)

Bailers (disposable plastic or stainless steel)

and/or submersible pumps

55-gallon drum or lab pack

Vinyl Chloride/Benzene Drager tube / *Drager pump*

pH meter

GMC-4 APR canister

Full face respirator

## **POTENTIAL HAZARDS/RISKS**

### **CHEMICAL**

☐ Hazard Present      Risk Level: ☐ H ☐ M ☒ L

What Justifies Risk Level? No known hazards suspected.

### **PHYSICAL**

☐ Hazard Present      Risk Level: ☐ H ☐ M ☒ L

What Justifies Risk Level? No known hazards suspected.

### **BIOLOGICAL**

☐ Hazard Present      Risk Level: ☐ H ☐ M ☒ L

What Justifies Risk Level? No known hazards suspected.

### **RADIOLOGICAL**

☐ Hazard Present      Risk Level: ☐ H ☐ M ☒ L

What Justifies Risk Level? No known hazards suspected.

## **LEVELS OF PROTECTION/JUSTIFICATION**

Initial level of protection will be Level D (modified) if justified by initial air ~~monitoring~~ *monitoring* at the sample locations.

## **SAFETY PROCEDURES REQUIRED AND/OR FIELD OPS UTILIZED**

An FID-OVA will be used to monitor for organic vapors before and during sampling to determine if upgrading (page 17) to a higher level of protection is require . See page 17 for action levels for upgrade. Vinyl Chloride/Benzene Drager tube monitoring applies (see Task 1). Purge water/liquid will be contained in a 55 gallon drum or lab pack. A pH meter shall be used to determine data for groundwater.

**TASK-BY-TASK RISK ASSESSMENT**  
(Complete One Sheet for Each Task)

**TASK DESCRIPTION**

**TASK 2C - SEDIMENT SAMPLING**

The Project Team will collect sediment samples from onsite and, potentially offsite, streams and drainage ditches. Team members will collect the samples from the edge of the ditch close to the bank using hand augers.

**EQUIPMENT REQUIRED/USED**

(Be specific, e.g., hand tools, heavy equipment, instruments, PPE)

FID-OVA (breathing zone)

Hand augers

Vinyl Chloride/Benzene Drager tube / *Drager Pump*

Scoops

**POTENTIAL HAZARDS/RISKS**

**CHEMICAL**

☐ Hazard Present Risk Level: ☐ H ☐ M ☒ L

What Justifies Risk Level? No known hazards suspected.

**PHYSICAL**

☐ Hazard Present Risk Level: ☐ H ☐ M ☒ L

What Justifies Risk Level? No known hazards ~~suspected.~~

**BIOLOGICAL**

☐ Hazard Present Risk Level: ☐ H ☐ M ☒ L

What Justifies Risk Level? No known hazards suspected.

**RADIOLOGICAL**

☐ Hazard Present Risk Level: ☐ H ☐ M ☒ L

What Justifies Risk Level? No known hazards suspected.

**LEVELS OF PROTECTION/JUSTIFICATION**

Initially, Level D (modified) protection will be worn if justified by initial air monitoring at the sample locations.

**SAFETY PROCEDURES REQUIRED AND/OR FIELD OPS UTILIZED**

An FID-OVA will be used to monitor for organic acids and vapors before and during sampling in the breathing zone to determine upgrading (page 17) to a higher level of protection is required. See page 17 for action levels for upgrade. Vinyl Chloride/Benzene Drager tube monitoring applies (see Task 1).

**TASK-BY-TASK RISK ASSESSMENT**  
(Complete One Sheet for Each Task)

**TASK DESCRIPTION**

**TASK 2D - SURFACE WATER SAMPLING**

The Project Team will collect water samples from onsite and, potentially, offsite surface water bodies. Team members will collect the samples from the edge of the water using a long-handled sampler or disposable bailer.

**EQUIPMENT REQUIRED/USED**

(Be specific, e.g., hand tools, heavy equipment, instruments, PPE)

FID-OVA (breathing zone)  
Long-handled sampler or disposable bailer  
Vinyl Chloride/Benzene Drager tube / *Drager pump*  
pH meter

**POTENTIAL HAZARDS/RISKS**

**CHEMICAL**

☐ Hazard Present      Risk Level: ☐ H ☐ M ☒ L

What Justifies Risk Level? No known hazards suspected.

**PHYSICAL**

☐ Hazard Present      Risk Level: ☐ H ☐ M ☒ L

What Justifies Risk Level? No known hazards suspected.

**BIOLOGICAL**

☐ Hazard Present      Risk Level: ☐ H ☐ M ☒ L

What Justifies Risk Level? No known hazards suspected.

**RADIOLOGICAL**

☐ Hazard Present      Risk Level: ☐ H ☐ M ☒ L

What Justifies Risk Level? No known hazards suspected.

**LEVELS OF PROTECTION/JUSTIFICATION**

Initially, Level D (modified) protection will be worn if justified by initial air monitoring at the sample locations.

**SAFETY PROCEDURES REQUIRED AND/OR FIELD OPS UTILIZED**

An FID-OVA will be used to monitor for organic gases and vapors before and during sampling in the breathing zone to determine if upgrading (page 17) to a higher level of protection is required. See page 17 for action levels for upgrade. Vinyl Chloride/Benzene Drager tube monitoring applies (see Task 1).

**TASK-BY-TASK RISK ASSESSMENT**  
(Complete One Sheet for Each Task)

**TASK DESCRIPTION**

**TASK 2E - WASTE SOURCE SAMPLING**

Soil and leachate from landfill as well as any water from surface impoundments will be sampled for contamination.

**EQUIPMENT REQUIRED/USED**

(Be specific, e.g., hand tools, heavy equipment, instruments, PPE)

FID-OVA (breathing zone)  
Vinyl Chloride/Benzene Drager tube / Drager Pump  
miniRAM  
Scoops

**POTENTIAL HAZARDS/RISKS**

**CHEMICAL**

☒ Hazard Present      Risk Level: ☐ H ☒ M ☐ L

What Justifies Risk Level? Direct sampling of waste source poses risk of chemical exposures. Proper PPE and <sup>continuous</sup> monitoring of air in breathing zone and monitoring waste source directly should provide adequate protection against chemical exposure hazards.

**PHYSICAL**

☐ Hazard Present      Risk Level: ☐ H ☐ M ☒ L

What Justifies Risk Level? No known hazards suspected.

**BIOLOGICAL**

☐ Hazard Present      Risk Level: ☐ H ☐ M ☒ L

What Justifies Risk Level? No known hazards suspected.

**RADIOLOGICAL**

☐ Hazard Present      Risk Level: ☐ H ☐ M ☒ L

What Justifies Risk Level? No known hazards suspected.

**LEVELS OF PROTECTION/JUSTIFICATION**

Initially, Level D (modified) protection will be worn if justified by initial air monitoring at the sample locations. Unless a miniRAM and action levels are specified below, work will stop when dust becomes visible in the air. Work will then proceed in Level C until dust is not longer visible.

**SAFETY PROCEDURES REQUIRED AND/OR FIELD OPS UTILIZED**

An FID-OVA will be used to monitor for organic acids and vapors before and during sampling in the breathing zone to determine upgrading (page 17) to a higher level of protection is required. See page 17 for action levels for upgrade. Vinyl Chloride/Benzene Drager tube monitoring applies (see Task 1).

## PERSONNEL PROTECTION PLAN

### Engineering Controls

Describe Engineering Controls used as part of Personnel Protection Plan:

#### Task(s)

**TASK 2A**

Soils may be moistened to suppress dust generation if conditions are dry and this is thought to be necessary by the SHSC.

### Administrative Controls

Describe Administrative controls used as part of Personnel Protection Plan:

#### Task(s)

An initial safety meeting will be held at the site before work starts subsequently, safety meetings will be held each morning and as needed. This will be done to keep all team members current on their knowledge of safety concerns at the site.

### Personnel Protective Equipment

Action Levels for Changing Levels of Protection. Define Action Levels for up or down grade for each task:

#### Task(s)

Action levels for changing levels of protection.

The FID-OVA action levels for up- or downgrade for each task are defined below.

#### OVA Reading

#### Action

> 1 unit above background

Test for presence of benzene and vinyl chloride using Drager tubes. Remain in Level D unless benzene is present (in any concentration) or vinyl chloride concentration is greater than 0.5 ppm, in which case, team will upgrade to Level C.

If benzene/vinyl chloride below action levels:

1-50 units above background Continue to work in Level D.

50-500 units above background Upgrade to Level C.

> 500 units above background Evacuate site.

For action levels for the radiation meter, refer to page 2321

For action levels for the miniRAM (if applicable) refer to page 23/7

## Description of Levels of Protection

Level D	Level D Modified
<b>Task(s): 1</b> <input checked="" type="checkbox"/> Head Hardhat  <input checked="" type="checkbox"/> Eye and Face Safety glasses <input type="checkbox"/> Hearing <input type="checkbox"/> Arms and Legs Only  <input checked="" type="checkbox"/> Appropriate Work Uniform Coveralls <input checked="" type="checkbox"/> Hand - Gloves Latex <input checked="" type="checkbox"/> Foot - Safety Boots Steel Toe Boots, overboots <input type="checkbox"/> Fall Protection <input type="checkbox"/> Flotation <input type="checkbox"/> Other	<b>Task(s): 2A, 2B, 2C, 2D, 2E</b> <input checked="" type="checkbox"/> Head Hardhat Safety glasses Face shield if free-phase product is found in the well and respirators are not req'd based on OVA readings  <input checked="" type="checkbox"/> Eye and Face TASK 2B <input type="checkbox"/> Hearing <input type="checkbox"/> Arms and Legs Only  <input checked="" type="checkbox"/> Whole Body TASK 2A Tyvek TASK 2B, C, D, E Saranex <input type="checkbox"/> Apron  <input checked="" type="checkbox"/> Hand - Gloves <input checked="" type="checkbox"/> Gloves Latex <input checked="" type="checkbox"/> Gloves Nitrile  <input checked="" type="checkbox"/> Foot - Safety Boots <input checked="" type="checkbox"/> Boots Steel Toe Boots <input checked="" type="checkbox"/> Boots Overboots

Description of Levels of Protection		
Level C		Level B
<b>Task(s): 2A, B, C, D, E</b>		<b>Task(s):</b>
<input checked="" type="checkbox"/> Head	Hardhat	<input type="checkbox"/> Head
<input type="checkbox"/> Eye and Face		<input type="checkbox"/> Eye and Face
<input type="checkbox"/> Hearing		<input type="checkbox"/> Hearing
<input type="checkbox"/> Arms and Legs Only		<input type="checkbox"/> Arms and Legs Only
<input type="checkbox"/> Whole Body		<input type="checkbox"/> Whole Body
<input checked="" type="checkbox"/> Apron	2A - Tyvek 2B, C, D, E - Saranex	<input type="checkbox"/> Apron
<input checked="" type="checkbox"/> Hand - Gloves		<input type="checkbox"/> Hand - Gloves
<input checked="" type="checkbox"/> Gloves	Latex	<input type="checkbox"/> Gloves
<input checked="" type="checkbox"/> Gloves	Nitrile	<input type="checkbox"/> Gloves
<input checked="" type="checkbox"/> Foot - Boots		<input type="checkbox"/> Foot - Boots
<input checked="" type="checkbox"/> Boots	Steel Toe Boots	<input type="checkbox"/> Boots
<input checked="" type="checkbox"/> Boots	Overboots	<input type="checkbox"/> Boots
<input type="checkbox"/> Half Face		
<input checked="" type="checkbox"/> Cart./Canister	GMC-H APR	<input type="checkbox"/> SAR - Airline
<input checked="" type="checkbox"/> Full Face	MSA Ultratwin	<input type="checkbox"/> SCBA
<input type="checkbox"/> Cart./Canister		<input type="checkbox"/> Comb. Airline/SCBA
<input type="checkbox"/> PAPR		<input type="checkbox"/> Cascade System
<input type="checkbox"/> Cart./Canister		<input type="checkbox"/> Compressor
<input type="checkbox"/> Type C		<input type="checkbox"/> Fall Protection
<input type="checkbox"/> Fall Protection		<input type="checkbox"/> Flotation
<input type="checkbox"/> Flotation		<input type="checkbox"/> Other
<input type="checkbox"/> Other		

# SITE OR PROJECT HAZARD MONITORING PROGRAM

## Direct Reading Air Monitoring Instruments

### Instrument Selection and Initial Check Record

Reporting Format: ☒ Field Notebook   ☐ Field Data Sheets   ☐ Air Monitoring Log   ☐ Trip Report   ☐ Other

Instrument	Task No.(s)	Number Required	Number Received	Checked Upon Receipt	Comment	Initial
<input type="checkbox"/> CGI				<input type="checkbox"/>		
<input type="checkbox"/> O <sub>2</sub>				<input type="checkbox"/>		
<input checked="" type="checkbox"/> CGI/O <sub>2</sub>	1, 2A, D, E			<input type="checkbox"/>		
<input type="checkbox"/> CGI/O <sub>2</sub> /tox-PPM, H <sub>2</sub> S, H <sub>2</sub> S/CO				<input type="checkbox"/>		
<input checked="" type="checkbox"/> RAD-GM microR	1			<input type="checkbox"/>		
<input type="checkbox"/> NaI				<input type="checkbox"/>		
<input type="checkbox"/> ZnS				<input type="checkbox"/>		
<input type="checkbox"/> Other				<input type="checkbox"/>		
<input type="checkbox"/> PID				<input type="checkbox"/>		
<input type="checkbox"/> HNU 10.2				<input type="checkbox"/>		
<input type="checkbox"/> HNU 11.7				<input type="checkbox"/>		
<input type="checkbox"/> Photovac, TMA				<input type="checkbox"/>		
<input type="checkbox"/> OVM				<input type="checkbox"/>		
<input type="checkbox"/> Other				<input type="checkbox"/>		
<input checked="" type="checkbox"/> FID	All			<input type="checkbox"/>		
<input checked="" type="checkbox"/> FOX 128				<input type="checkbox"/>		
<input type="checkbox"/> Heath, AID, Other				<input type="checkbox"/>		
<input checked="" type="checkbox"/> RAM, Mini-RAM, Other	1, 2a, 2e			<input type="checkbox"/>		
<input type="checkbox"/> Monitox-HCN				<input type="checkbox"/>		
<input type="checkbox"/> H <sub>2</sub> S				<input type="checkbox"/>		
<input type="checkbox"/> COCL				<input type="checkbox"/>		
<input type="checkbox"/> SO <sub>2</sub>				<input type="checkbox"/>		
<input type="checkbox"/> Other				<input type="checkbox"/>		
<input type="checkbox"/> Bio-Aerosol Monitor				<input type="checkbox"/>		
<input checked="" type="checkbox"/> Detector Tubes	All tasks			<input type="checkbox"/>		
<input checked="" type="checkbox"/> Pump - MSA, Dräger, Sensidyne	All tasks			<input type="checkbox"/>		
<input checked="" type="checkbox"/> Tubes/type: Benzene (.5/a)				<input type="checkbox"/>		
<input checked="" type="checkbox"/> Tubes/type: Vinyl Chloride (.5/a)				<input type="checkbox"/>		
<input type="checkbox"/> Other				<input type="checkbox"/>		



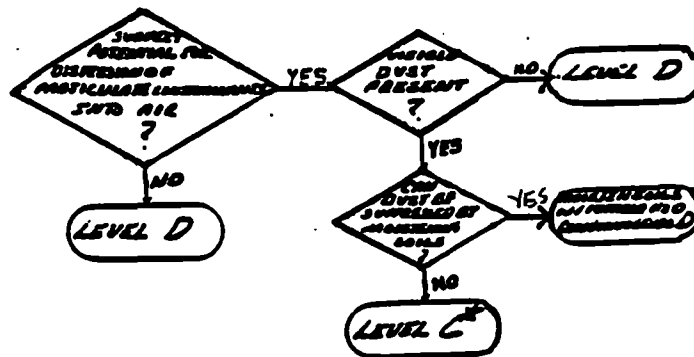
**ACTION LEVELS FOR ARCS PA, SI, AND ESI FIELD WORK AT  
INCOMPLETELY CHARACTERIZED SITES**

**PARTICULATE ACTION LEVELS**

This action level may only be used if:

- 1) Concentration of known contaminants in soil is undetermined, and
- 2) 1/2(pel/tlv) of suspected contaminants in the soil is greater than the 1/2 (nuisance dust limit) value of 2.5 mg/kg.

\* Requires that an SHSC certified in the appropriate level of protection be present.



# SITE OR PROJECT HAZARD MONITORING PROGRAM

**Direct Reading Air Monitoring Instruments Calibration Record To Be Completed in the Field Logbook**

[illegible]

## SITE AIR MONITORING PROGRAM

### Direct Reading Air Monitoring Instruments

**Air Monitoring Instrument:** FID - FOXBORO OVA

**Air Monitoring Frequency:** All tasks

- ☐ Periodically:  
☐ Periodically:  
☒ Continuously:  
☐ Other:

#### Monitoring Locations

- |  |                    |
|--|--------------------|
| <input checked="" type="checkbox"/> Upwind/downwind of site activities   | All (periodically) |
| <input checked="" type="checkbox"/> Near residents, etc.   | Task 1             |
| <input checked="" type="checkbox"/> Key site activity locations:   |                    |
| <input checked="" type="checkbox"/> Decon area   | All (periodically) |
| <input checked="" type="checkbox"/> Staging area   | All (periodically) |
| <input type="checkbox"/> Excavation area   |                    |
| <input checked="" type="checkbox"/> Field lab area   | All (periodically) |
| <input checked="" type="checkbox"/> Storage tanks  | All (periodically) |
| <input checked="" type="checkbox"/> Lagoons  | All (periodically) |
| <input checked="" type="checkbox"/> Drums  | All (periodically) |
| <input type="checkbox"/> Fixed stations  |                    |
| <input checked="" type="checkbox"/> Other: Monitor in breathing zone during reconnaissance and site evaluation, and at each sample station immediately prior to & during sampling. Use of detector tubes may be required in conjunction with the use of the OVA. |                    |

**Air Monitoring Instrument:** microR

**Air Monitoring Frequency:**

- ☐ Periodically:  
☐ Periodically:  
☐ Continuously:  
☒ Other: Area should be cleared with radiation meter prior to start of work.

#### Monitoring Locations

- ☐ Upwind/downwind of site activities  
☐ Near residents, etc.  
☐ Key site activity locations:  
    ☐ Decon area  
    ☐ Staging area  
    ☐ Excavation area  
    ☐ Field lab area  
    ☐ Storage tanks  
    ☐ Lagoons  
    ☐ Drums  
☐ Fixed stations  
☒ Other: Monitor sweeping from waist level to breathing zone.

## SITE AIR MONITORING PROGRAM

### Direct Reading Air Monitoring Instruments

**Air Monitoring Instrument:** miniRAM

**Air Monitoring Frequency:**

- ☐ Periodically:
- ☐ Periodically:
- ☐ Continuously:
- ☒ Other: Air monitoring should be performed during reconnaissance and during all soil and waste source sampling.

#### Monitoring Locations

- ☒ Upwind/downwind of site activities
- ☒ Near residents, etc.
- ☒ Key site activity locations:
- ☒ Decon area
  - ☒ Staging area
  - ☐ Excavation area
  - ☒ Field lab area
  - ☐ Storage tanks
  - ☐ Lagoons
  - ☐ Drums
- ☐ Fixed stations
- ☐ Other:

**Air Monitoring Instrument:** Drager Pump/Benzene & Vinyl Chloride Colormetric Tubes

**Air Monitoring Frequency:**

- ☐ Periodically:
- ☐ Periodically:
- ☐ Continuously:
- ☒ Other: See Decision Tree page 17.

#### Monitoring Locations

- ☐ Upwind/downwind of site activities
- ☐ Near residents, etc.
- ☐ Key site activity locations:
- ☐ Decon area
  - ☐ Staging area
  - ☐ Excavation area
  - ☐ Field lab area
  - ☐ Storage tanks
  - ☐ Lagoons
  - ☐ Drums
- ☐ Fixed stations
- ☒ Other: If specified for project, monitor in breathing zone during reconnaissance and site evaluation, and at each sample location immediately prior to and during sampling.

## SITE AIR MONITORING PROGRAM

### Action Levels

These Action Levels, if not defined by regulation, are some percent (usually 50%) of the applicable PEL/REL/TLV. That number must also be adjusted to account for instrument response factors.

Tasks		Action Level		Action
<input checked="" type="checkbox"/> Explosive atmosphere	1, 2A, E	Ambient Air Concentration	Confined Space Concentration	
		< 10% LEL	0 to 1% LEL	Work may continue. Consider toxicity potential.
		10 to 25% LEL	1 to 10% LEL	Work may continue. Increase monitoring frequency.
		> 25% LEL	> 10% LEL	Work must stop. Ventilate area before returning.
<input type="checkbox"/> Oxygen		Ambient Air Concentration	Confined Space Concentration	
		< 19.5% O <sub>2</sub>	< 19.5% O <sub>2</sub>	Leave Area. Re-enter only with self-contained breathing apparatus.
		19.5% to 25% O <sub>2</sub>	19.5% to 23.5% O <sub>2</sub>	Work may continue. Investigate changes from 21%.
		> 25% O <sub>2</sub>	> 23.5% O <sub>2</sub>	Work must stop. Ventilate area before returning.
<input checked="" type="checkbox"/> Radiation (none suspected)	Task 1	< 3 times background 3 Times Background to < 1 mR/hour  		

## SITE AIR MONITORING PROGRAM

### Ambient Air Sampling

Check situations which will require or action levels which will apply to deciding to institute or increase scope of planned air sampling.

- ☒ No air sampling is required on this site.
- ☐ An air sampling plan is incorporated in this HASP.

### Meteorological Conditions

- ☐ Dry weather for \_\_\_\_ days
- ☐ Ambient temperature above \_\_\_\_ °F
- ☐ Wind increasing potential of more contaminant dispersion in or migration out of controlled area.

#### Activities which will require instituting or increasing scope of air sampling:

- ☐ Major spills
- ☐ New site activity resulting in potential presence of new chemical hazards.
- ☐ Site activity increases airborne contaminants possibilities.
- ☐ Air sampling documentation required for:
- ☐ Downgrading from stipulated level of protection
  - ☐ Documenting no migration of contaminants offsite through air

#### Applicable Action Levels for instituting Air Sampling:

- ☐ Visible vapor/gas clouds or vapor levels, or
- ☐ Visible dust or particulate levels measured with Direct Reading Instrument, two-three times background or above action level, sustained over 10-15 minute period.

#### The following requirements apply to air sampling:

**Sampling Matrix/Air Interface** - Monitor matrix/air interface and breathing zone periodically with DRI. If vapor levels > 2-3 times background, monitor continuously. Follow No. 4.

**Container Opening** - Monitor opening and breathing zone periodically with DRI. If vapor levels > 2-3 times background, monitor opening and breathing zone continuously. Follow No. 4.

**Excavation/Drilling/Intrusive Work** - Monitor at ground level and breathing zone periodically with DRI. If vapor levels > 2-3 times background, monitor opening and breathing zone continuously. Follow No. 4.

**Breathing Zone** - Ensure level of protection specified in HASP is being used. Consult HASP or Corporate Health and Safety relative to instituting personnel, area, or perimeter sampling.

- ☐ Other

SITE AIR MONITORING PROGRAM				
Physical Hazard and Miscellaneous Monitors and Detectors				
	Task(s)	Calibration Required?/Method	Location	Frequency
<input type="checkbox"/> Sound Level Meter		<input type="checkbox"/>		
<input type="checkbox"/> Noise Dosimeter(s)		<input type="checkbox"/>		
<input type="checkbox"/> Octave Band Analyzer		<input type="checkbox"/>		
<input type="checkbox"/> Electric Circ. Detector		<input type="checkbox"/>		
<input type="checkbox"/> Thermometer		<input type="checkbox"/>		
<input type="checkbox"/> Wind Speed Indicator		<input type="checkbox"/>		
<input type="checkbox"/> Barometer		<input type="checkbox"/>		
<input type="checkbox"/> Psychrometer		<input type="checkbox"/>		
<input type="checkbox"/> Infrared Thermometer		<input type="checkbox"/>		
<input type="checkbox"/> Microwave Detector		<input type="checkbox"/>		
<input checked="" type="checkbox"/> pH Meter	2B	<input checked="" type="checkbox"/> STD. Buffer, To be used at well locations		
Indicator Kits				
	Task(s)	Location	Frequency	
<input checked="" type="checkbox"/> pH Paper	2B, D	Sample Preparation Area in support zone		
<input type="checkbox"/> Peroxide Paper				
<input type="checkbox"/> Chlor-N-Oil Kit				
<input type="checkbox"/> Hazard Categorizing Kit				
<input type="checkbox"/> Asbestos Test Kit				





## CONTINGENCIES

### Emergency Contacts and Phone Numbers

Agency	Contact	Phone Number
Local Medical Emergency Facility	Garland Community Hospital	1-214-276-7116
WESTON Medical Emergency Contact	EMR - Dr. Barnes	1-800-229-3674
WESTON Health and Safety	George Crawford	(610) 701-7406 or (610) 692-3030
	Darryl Drenon	1-800-507-1892
Fire Department	Cindy Mayhahn	205-2250
Police Department	Pat McLain	205-2012
Onsite Coordinator	Robert Beck	210-342-7810
Site Telephone	none	abandoned site
Nearest Telephone	Field Team Leader	Hotel (TBD)

### Local Medical Emergency Facility(s)

**Name of Hospital:** Garland Community Hospital

**Address:** 2696 W. Walnut, Garland, Texas 70542

**Phone No.:**

**Name of Contact:**

**Phone No.:**

**Type of Service:**

- ☐ Physical trauma only
- ☐ Chemical exposure only
- ☒ Physical trauma and chemical exposure
- ☒ Available 24 hours

**Route to Hospital (written detail):**

Take Hwy 66 west to 78 W. Go north on North Star Rd. and then west on Walnut. The hospital is located at 2696 W. Walnut between Jupiter and Shiloh.

**Travel time from site:**  
30 min.

**Distance to hospital:**  
18 miles

**Name/No. of 24-hr**

**Ambulance Service:**  
Garland Community  
214-276-7116

### Secondary or Specialty Service Provider

**Name of Hospital:**

**Address:**

**Phone No.:**

**Name of Contact:**

**Phone No.:**

**Type of Service:**

- ☐ Physical trauma only
- ☐ Chemical exposure only
- ☐ Physical trauma and chemical exposure
- ☐ Available 24 hours

**Route to Hospital (written detail):**

**Travel time from site:**

**Distance to hospital:**

**Name/No. of 24-hr**

**Ambulance Service:**

Figure 1. Route to Hospital  
(Draw map to hospital here if space permits or attach on next sheet.)

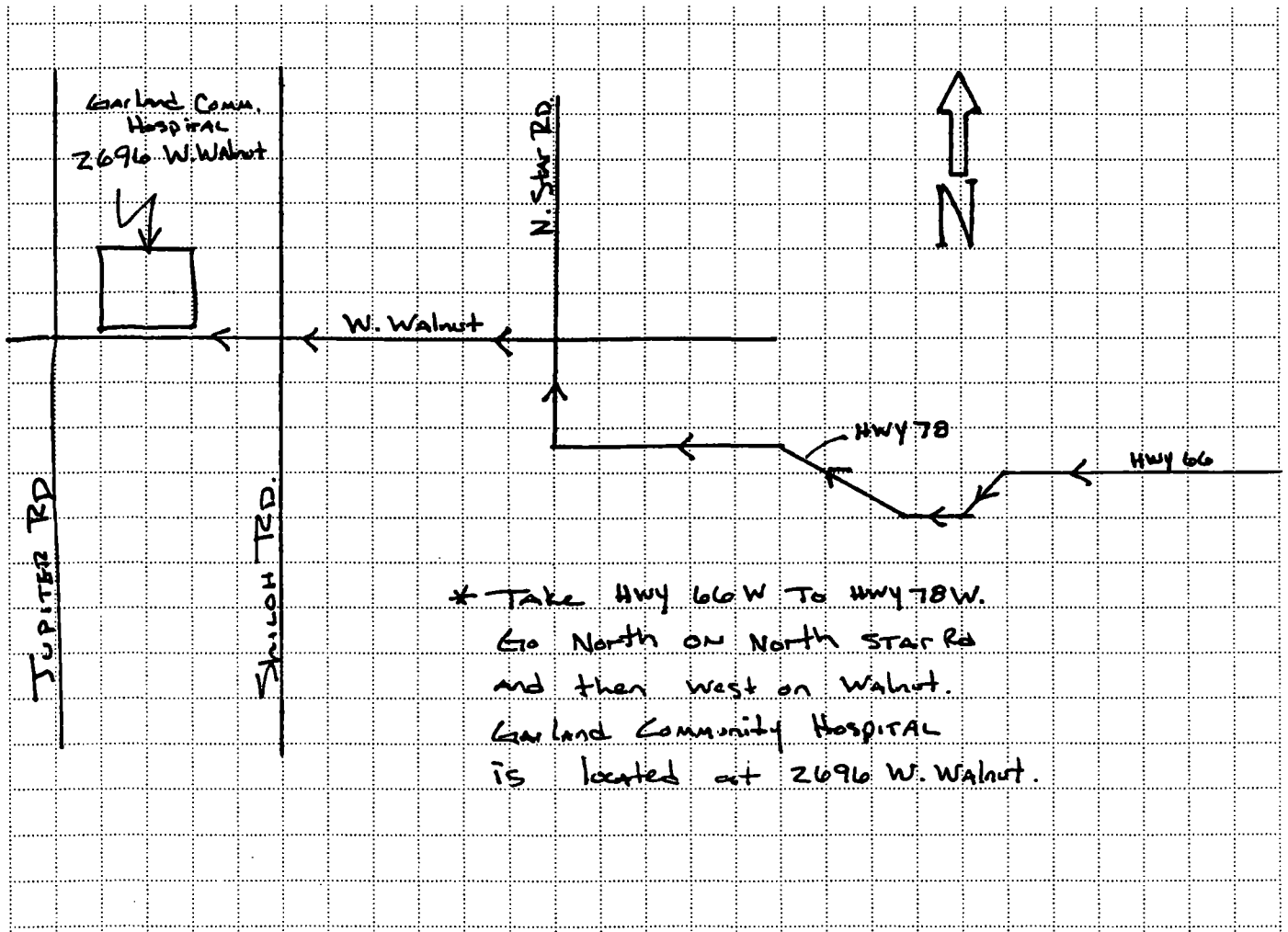


Figure 1 - Route to Hospital (Map)

# CONTINGENCIES

## Response Plans

### Medical - General

Provide First Aid as trained, assess and determine need for further medical assistance, Transport or arrange for transport after appropriate decontamination

#### First Aid Kit:

#### Type

25 man  
Infection  
Control Kit

#### Location

WESTON or  
rental van

Special First Ai  
Procedures:  
Cyanides on sit  
☐ Yes ☐ No.  
If yes, contact  
LMF. Do they  
have antidote  
kit?  
☐ Yes ☐ No

#### Eyewash required

☒ Yes ☐ No

#### Type

#### Location

First aid kit in  
van

HF on site  
☐ Yes ☐ No.  
If yes, need  
neutralizing  
ointment for FA  
kit. Contact  
LMF.

*Shower*

#### Eyewash required

☐ Yes ☒ No

#### Type

#### Location

### Plan for Response to Spill/Release

In the event of a spill or  
release, ensure safety,  
assess situation and  
perform containment and  
control measures as  
appropriate:

- Clean up per MSDS if  
small or; Sound  
Alarm, call for  
assistance, Notify  
Emergency  
Coordinator
- Evacuate to pre-  
determined safe  
place
- Account for  
personnel
- Determine if can  
respond safely
- Mobilize per Site Spill  
Response Plan

### Plan for Response to Fire/Explosion

In the event of a fire or  
explosion, ensure  
personal safety, assess  
situation and:

- Sound Alarm and call  
assistance, Notify  
Emergency Coordinator
- Evacuate to predeter-  
mined safe place
- Account for personnel
- Use fire extinguisher,  
only if safe and trained
- Standby to inform  
Emergency responders of  
materials and conditions

### Fire Extinguishers

Type Location  
ABC fire ext. in  
vehicle

### Description Spill Response Gear

#### Location

### Description (Other Fire Response Equipment)

#### Location

### Plan to Response to Security Problems

## DECONTAMINATION PLAN

### Personnel Decontamination

Consistent with the levels of protection required, step-by-step procedures for personnel decontamination for each Level of Protection are attached.

### Levels of Protection Required for Decontamination Personnel

The levels of protection required for personnel assisting with decontamination will be:

☐ Level B

☐ Level C

☒ Level D

Modifications include: Modifications to Level D for this work are that Nitrile and Latex gloves will be worn by decontamination personnel working in Level D.

### Disposition of Decontamination Wastes

Provide a description of waste disposition including identification of storage area, hauler, and final disposal site, if applicable:

- Personnel protective equipment (PPE) including tyvek, saranex, boot covers, gloves and other disposables will be washed in potable water to remove gross contamination and then rinsed with potable water for decontamination purposes. Subsequently, the PPE will be removed and rendered unusable by shredding it with a knife. The unusable PPE will be double bagged in two plastic trash bags and disposed of in a trash dumpster, or alternatively it will be drummed and stored onsite for later disposal by EPA or WESTON. If stored onsite, the decontamination wastes will be stored onsite in an area designated by the site representative or owner.
- Equipment/PPE decontamination rinseate water will be collected over the course of the field work in five gallon plastic buckets or a small drum which will have a lid that can be sealed. If the site representative approves, the rinseate water will be poured into a known or potential hazardous waste unit at the site for disposal. Otherwise, the water will be sampled using procedures similar to those for the surface water sampling task, sealed in the buckets or drum, labeled, stored in a convenient location onsite (designated by site representative) and disposed of offsite by EPA or WESTON at a later date.

### Equipment Decontamination

A procedure for decontamination steps required for non-sampling equipment and heavy machinery follows:

Non sampling equipment, such as monitoring instruments, will not be exposed to sources of contamination. They will be cleaned with a damp towel or by other appropriate means. There will be no heavy machinery associated with the project other than a van and a car. Vehicles will not be driven into areas of known or suspected contamination.

### Sampling Equipment Decontamination

Sampling equipment will be decontaminated in accordance with the following procedure:

Non disposable equipment will be washed in a tub with potable water and scrub brushes, washed with a solution of non-phosphate detergent and potable water, rinsed three times with deionized water, and allowed to air dry between sample locations. It may be decontaminated with hexane and ethanol onsite before it is returned to WESTON Regional Equipment Stores.

## LEVEL D/MODIFIED LEVEL D DECONTAMINATION PLAN

Check indicated functions or add steps as necessary:

Function	Description of Process, Solution, and Container
<input checked="" type="checkbox"/> Segregated equipment drop	Plastic Sheet
<input checked="" type="checkbox"/> Boot cover and glove wash	Non-phosphate in a tub
<input checked="" type="checkbox"/> Boot cover and glove rinse	Non-phosphate in a tub or spray bottle
<input checked="" type="checkbox"/> Tape removal - outer glove and boot	Double Bag for Disposal
<input checked="" type="checkbox"/> Boot cover removal	Double Bag for Disposal
<input checked="" type="checkbox"/> Outer glove removal	Double Bag for Disposal

### HOTLINE

<input type="checkbox"/> Suit/safety boot wash	
<input type="checkbox"/> Suit/boot/glove rinse	
<input checked="" type="checkbox"/> Safety boot removal	Plastic Bag for Cleaning if necessary
<input checked="" type="checkbox"/> Suit removal	Bag for Cleaning
<input type="checkbox"/> Inner glove wash	Non-phosphate detergent solution in a bucket
<input type="checkbox"/> Inner glove rinse	Deionized water in a bucket
<input checked="" type="checkbox"/> Inner glove removal	Double Bag for Disposal
<input type="checkbox"/> Inner clothing removal	

### CRC/SAFE ZONE BOUNDARY

<input checked="" type="checkbox"/> Field wash	Replace gloves, boot cover
<input checked="" type="checkbox"/> Redress	Replace suit if necessary

#### Disposal Plan, End of Day:

All waste PPE will be double bagged in plastic trash bags. Waste PPE may be stored in a drum onsite on a daily basis, or it may be disposed of daily as indicated for End of Project disposal below.

#### Disposal Plan, End of Week:

#### Disposal Plan, End of Project:

Double bagged waste PPE will be disposed of in an appropriate trash dumpster. Alternatively it will be left onsite in a drum for subsequent disposal by EPA or WESTON.

## LEVEL C DECONTAMINATION PLAN

Check indicated functions or add steps as necessary:

Function	Description of Process, Solution, and Container
<input checked="" type="checkbox"/> Segregated equipment drop	Plastic (Visqueen) sheet on ground
<input checked="" type="checkbox"/> Boot cover and glove wash	Non-phosphate detergent solution in a tub
<input checked="" type="checkbox"/> Boot cover and glove rinse	Potable water in a tub
<input checked="" type="checkbox"/> Tape removal - outer glove and boot	Double Bag for Disposal
<input checked="" type="checkbox"/> Boot cover removal	Double Bag for Disposal
<input checked="" type="checkbox"/> Outer glove removal	Double Bag for Disposal
<b>HOTLINE</b>	
<input checked="" type="checkbox"/> Suit/safety boot wash	Non-phosphate detergent solution in a tub
<input checked="" type="checkbox"/> Suit/boot/glove rinse	Potable water in a tub
<input checked="" type="checkbox"/> Safety boot removal	Plastic bag for cleaning
<input checked="" type="checkbox"/> Suit removal	Bag for disposal in a tub
<input type="checkbox"/> Inner glove wash	Non-phosphate detergent solution in a tub
<input type="checkbox"/> Inner glove rinse	Potable water in a tub
<input checked="" type="checkbox"/> Face piece removal	Plastic cloth
<input type="checkbox"/> Inner glove removal	Double Bag for Disposal
<input type="checkbox"/> Inner clothing removal	
<b>CRC/SAFE ZONE BOUNDARY</b>	
<input type="checkbox"/> Field wash	
<input type="checkbox"/> Redress	
<b>Disposal Plan, End of Day:</b> See plan for Level D.	
<b>Disposal Plan, End of Week:</b>	
<b>Disposal Plan, End of Project:</b> See plan for Level D.	

# SITE PERSONNEL AND CERTIFICATION STATUS

## WESTON

Name: Robert Beck  
Title: Project Manager  
Task(s): All  
Certification Level or Description: B-T, C-T, D-T

☒ Medical Current ☒ Training Current  
☒ Fit Test Current (Qual.) ☐ Fit Test Current (Quant.)

Name: Dan Johnson\*  
Title: Assistant Engineer  
Task(s): All  
Certification Level or Description: B-T, C-S, D-S

☒ Medical Current ☒ Training Current  
☒ Fit Test Current (Qual.) ☐ Fit Test Current (Quant.)

Name: Billy Cress\*  
Title: Assistant Engineer  
Task(s): All  
Certification Level or Description: B-T, C-T, D-S

☒ Medical Current ☒ Training Current  
☒ Fit Test Current (Qual.) ☐ Fit Test Current (Quant.)

Name: Troy Hile  
Title: Assistant Engineer  
Task(s): All  
Certification Level or Description: B-T, C-T, D-T

☒ Medical Current ☒ Training Current  
☒ Fit Test Current (Qual.) ☐ Fit Test Current (Quant.)

Name: Richard Bost  
Title: Assistant Engineer  
Task(s): All  
Certification Level or Description: B-T, C-T, D-T

☒ Medical Current ☒ Training Current  
☒ Fit Test Current (Qual.) ☐ Fit Test Current (Quant.)

Name: Jeff Criner\*  
Title: Project Scientist  
Task(s): All  
Certification Level or Description: B-S, C-S, D-S

☒ Medical Current ☒ Training Current  
☒ Fit Test Current (Qual.) ☐ Fit Test Current (Quant.)

Name: Almee Kambhu  
Title: Associate Geologist  
Task(s): All  
Certification Level or Description: B-T, C-T, D-S

☒ Medical Current ☒ Training Current  
☒ Fit Test Current (Qual.) ☐ Fit Test Current (Quant.)

Name: John Warren  
Title: Associate Engineer  
Task(s): All  
Certification Level or Description: B-T, C-T, D-S

☒ Medical Current ☒ Training Current  
☒ Fit Test Current (Qual.) ☐ Fit Test Current (Quant.)

Name: **RIA AIKEN**  
Title: **ASSISTANT PROJECT SCIENTIST**  
Task(s): **ALL**  
Certification Level or Description: **B-T, C-T, D-T**

☒ Medical Current ☒ Training Current  
☒ Fit Test Current (Qual.) ☐ Fit Test Current (Quant.)

Name:  
Title:  
Task(s):  
Certification Level or Description:

☐ Medical Current ☐ Training Current  
☐ Fit Test Current (Qual.) ☐ Fit Test Current (Quant.)

**TRAINING CURRENT - Training:** All personnel, including visitors, entering the exclusion or contamination reduction zones must have certifications of completion of training in accordance with OSHA 29 CFR 1910, 29 CFR 1926 or 29 CFR 1910.120.

**FIT TEST CURRENT - Respirator Fit Testing:** All persons, including visitors, entering any area requiring the use or potential use of any negative pressure respirator must have had as a minimum, a qualitative fit test, administered in accordance with OSHA 29 CFR 1910.134 or ANSI within the last 12 months. If site conditions require the use of a full face negative pressure, air purifying respirator for protection from Asbestos or Lead, employees must have had a quantitative fit test, administered according to OSHA 29 CFR 1910.1001 or 1025 within the last 6 months.

**MEDICAL CURRENT - Medical Monitoring Requirements:** All personnel, including visitors, entering the exclusion or contamination reduction zones must be certified as medically fit to work, and to wear a respirator, if appropriate, in accordance with 29 CFR 1910, 29 CFR 1926/1910 or 29 CFR 1910.120.

The Site Health and Safety Coordinator is responsible for verifying all certifications and fit tests.

\*Approved Site Health and Safety Coordinator for Level of protection as indicated by D-S, C-S, or B-S.





[illegible]

**ATTACHMENT "A"**  
**CHEMICAL CONTAMINANTS**  
**DATA SHEETS**

# HEALTH AND SAFETY EVALUATION - 1 CHEMICAL HAZARDS

Hazardous Substance/Tasks	Physical Properties	Normal Physical State	State At Site/Proj. Temp.	Characteristics	Exposure Limits	Route(s) of Exposure/Symptoms	Monitoring Instruments/Ionization Potential + % Response
Benzene	<input type="checkbox"/> Explosive <input checked="" type="checkbox"/> Flammable <input type="checkbox"/> Corrosive <input type="checkbox"/> Reactive <input type="checkbox"/> Water Reactive <input type="checkbox"/> Oxidizer	<input type="checkbox"/> Solid <input checked="" type="checkbox"/> Liquid <input type="checkbox"/> Gas	<input type="checkbox"/> Solid <input checked="" type="checkbox"/> Liquid <input type="checkbox"/> Gas	pH: NA FP: 12°F LEL: 1.3% UEL: 7.9% Auto. Ig.: NA BP: 176°F	<input checked="" type="checkbox"/> CA <input checked="" type="checkbox"/> PEL 1 ppm <input checked="" type="checkbox"/> TLV 0.1 ppm <input checked="" type="checkbox"/> IDLH 3000 ppm <input type="checkbox"/> Only toxicological data available <input type="checkbox"/> Other:	<input checked="" type="checkbox"/> Inhalation <input checked="" type="checkbox"/> Ingestion <input checked="" type="checkbox"/> Skin Absorption <input checked="" type="checkbox"/> Contact <input type="checkbox"/> Direct Penetration <input type="checkbox"/> Other:	<input type="checkbox"/> PID <input type="checkbox"/> 11.7 eV <input type="checkbox"/> 10.2 eV <input type="checkbox"/> OVM <input type="checkbox"/> CGI <input checked="" type="checkbox"/> OVA <input type="checkbox"/> _____
CAS No: 71-43-2	<input type="checkbox"/> Radioactive <input type="checkbox"/> Other	Incompatible With: Strong oxidizers, many fluorides, and perchlorates, nitric acid		MP: NA Sp. Gr.: 0.88 Vap. D.: NA Vap. P.: 75 mm H <sub>2</sub> O Sol.: 0.07% Other:		Symptoms: irrit. eyes, nose, resp. sys.; gidd; head, nau, stg. gait, fatigue, anor, lass, derm.	IP: 9.24 eV % Response: 150%
Synonyms: Benzol Phenyl hydride							

# HEALTH AND SAFETY EVALUATION - 1 CHEMICAL HAZARDS

Hazardous Substance/Task	Physical Properties	Normal Physical State	State At Site/Proj. Temp.	Characteristics	Exposure Limits	Route(s) of Exposure/Symptoms	Monitoring Instruments/Ionization Potential + % Response
Ethylbenzene	<input type="checkbox"/> Explosive <input checked="" type="checkbox"/> Flammable <input type="checkbox"/> Corrosive <input type="checkbox"/> Reactive <input type="checkbox"/> Water Reactive <input type="checkbox"/> Oxidizer	<input type="checkbox"/> Solid <input checked="" type="checkbox"/> Liquid <input type="checkbox"/> Gas	<input type="checkbox"/> Solid <input checked="" type="checkbox"/> Liquid <input type="checkbox"/> Gas	pH: NA FP: 55°F LEL: 1.0% UEL: 6.7% Auto. Ig.: NA BP: 227°F	<input type="checkbox"/> CA (435mg/m³) <input checked="" type="checkbox"/> PEL 435 mg/m³ (545mg/m³) <input checked="" type="checkbox"/> TLV 645 mg/m³ (125ppm) <input checked="" type="checkbox"/> IDLH 2000 ppm <input type="checkbox"/> Only toxicological data available <input type="checkbox"/> Other:	<input checked="" type="checkbox"/> Inhalation <input checked="" type="checkbox"/> Ingestion <input type="checkbox"/> Skin Absorption <input checked="" type="checkbox"/> Contact <input type="checkbox"/> Direct Penetration <input type="checkbox"/> Other:	<input type="checkbox"/> PID <input type="checkbox"/> 11.7 eV <input type="checkbox"/> 10.2 eV <input type="checkbox"/> OVM <input type="checkbox"/> CGI <input checked="" type="checkbox"/> OVA <input type="checkbox"/> _____
CAS No: 100-41-4	<input type="checkbox"/> Radioactive <input type="checkbox"/> Other	Incompatible With: Strong oxidizers		MP: NA Sp. Gr.: 0.87 Vap. D.: NA Vap. P.: 10 mm (79°F) H₂O Sol.: 0.01% Other:		Symptoms: irrit. eyes, muc. memb. head, derm, narco, coma	IP: 8.76 eV % Response: 100%
Synonyms: Ethylbenzol Phenylethane							

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Hazardous Substance/Task	Physical Properties	Normal Physical State	State At Site/Proj. Temp.	Characteristics	Exposure Limits	Route(s) of Exposure/Symptoms	Monitoring Instruments/Ionization Potential + % Response
Methane	<input checked="" type="checkbox"/> Explosive <input type="checkbox"/> Flammable <input type="checkbox"/> Corrosive <input type="checkbox"/> Reactive <input type="checkbox"/> Water Reactive <input type="checkbox"/> Oxidizer	<input type="checkbox"/> Solid <input type="checkbox"/> Liquid <input checked="" type="checkbox"/> Gas	<input type="checkbox"/> Solid <input type="checkbox"/> Liquid <input checked="" type="checkbox"/> Gas	pH: NA FP: 296.5°F LEL: 5.3% UEL: 16% Auto. Ig.: 650 BP: 161°F	<input type="checkbox"/> CA <input type="checkbox"/> PEL _____ <input type="checkbox"/> TLV _____ <input type="checkbox"/> IDLH _____ <input type="checkbox"/> Only toxicological data available <input type="checkbox"/> Other:	<input checked="" type="checkbox"/> Inhalation <input type="checkbox"/> Ingestion <input type="checkbox"/> Skin Absorption <input type="checkbox"/> Contact <input type="checkbox"/> Direct Penetration <input type="checkbox"/> Other:	<input type="checkbox"/> PID <input type="checkbox"/> 11.7 eV <input type="checkbox"/> 10.2 eV <input type="checkbox"/> OVM <input type="checkbox"/> CGI <input checked="" type="checkbox"/> OVA <input type="checkbox"/> _____
CAS No:	<input type="checkbox"/> Radioactive <input type="checkbox"/> Other	Incompatible With: Powerful oxidizers, halogens, or interhalogens		MP: 187.6°F		Symptoms:	IP:
Synonyms:				Sp. Gr.: 0.55			
				Vap. D.: .6			
				Vap. P.: NA			
				H <sub>2</sub> O Sol.: Miscible			
				Other:			% Response: 100%

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Hazardous Substance/Tasks	Physical Properties	Normal Physical State	State At Site/Proj. Temp.	Characteristics	Exposure Limits	Route(s) of Exposure/Symptoms	Monitoring Instruments/Ionization Potential + % Response
Toluene	<input type="checkbox"/> Explosive <input checked="" type="checkbox"/> Flammable <input type="checkbox"/> Corrosive <input type="checkbox"/> Reactive <input type="checkbox"/> Water Reactive <input type="checkbox"/> Oxidizer	<input type="checkbox"/> Solid <input checked="" type="checkbox"/> Liquid <input type="checkbox"/> Gas	<input type="checkbox"/> Solid <input checked="" type="checkbox"/> Liquid <input type="checkbox"/> Gas	pH: NA FP: 40°F LEL: 1.2% UEL: 7.1% Auto. Ig.: NA BP: 23.2°F	<input type="checkbox"/> CA <input checked="" type="checkbox"/> PEL 100 ppm <input checked="" type="checkbox"/> TLV 150 ppm <input checked="" type="checkbox"/> IDLH 2000 ppm <input type="checkbox"/> Only toxicological data available <input type="checkbox"/> Other:	<input checked="" type="checkbox"/> Inhalation <input checked="" type="checkbox"/> Ingestion <input checked="" type="checkbox"/> Skin Absorption <input checked="" type="checkbox"/> Contact <input type="checkbox"/> Direct Penetration <input type="checkbox"/> Other:	<input type="checkbox"/> PID <input type="checkbox"/> 11.7 eV <input type="checkbox"/> 10.2 eV <input type="checkbox"/> OVM <input type="checkbox"/> CGI <input checked="" type="checkbox"/> OVA <input type="checkbox"/> _____
CAS No: 108-88-3	<input type="checkbox"/> Radioactive <input type="checkbox"/> Other	Incompatible With: Strong oxidizers		MP: 139°F Sp. Gr.: 0.87		Symptoms: fatigue, weak; conf, euph, dizz, head, dilated pupils, lac; ner, musc. ftg.; insom; derm.	IP: 8.82 eV
Synonyms: Methyl benzene Methyl benzol Phenyl methane Toluol			Vap. D.: NA Vap. P.: 20 mm (65°F) H <sub>2</sub> O Sol.: 0.05% (61°F)	% Response: 110%			
			Other:				

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Hazardous Substance/Tasks	Physical Properties	Normal Physical State	State At Site/Proj. Temp.	Characteristics	Exposure Limits	Route(s) of Exposure/Symptoms	Monitoring Instruments/Ionization Potential + % Response
Vinyl Chloride	<input type="checkbox"/> Explosive <input checked="" type="checkbox"/> Flammable <input type="checkbox"/> Corrosive <input type="checkbox"/> Reactive <input type="checkbox"/> Water Reactive <input type="checkbox"/> Oxidizer	<input type="checkbox"/> Solid <input type="checkbox"/> Liquid <input checked="" type="checkbox"/> Gas	<input type="checkbox"/> Solid <input type="checkbox"/> Liquid <input checked="" type="checkbox"/> Gas	pH: NA FP: NA LEL: 5.3% UEL: 33% Auto. Ig.: NA BP: 7°F	<input checked="" type="checkbox"/> CA <input type="checkbox"/> PEL _____ <input checked="" type="checkbox"/> TLV 1 ppm <input type="checkbox"/> IDLH _____ <input type="checkbox"/> Only toxicological data available <input type="checkbox"/> Other:	<input checked="" type="checkbox"/> Inhalation <input type="checkbox"/> Ingestion <input type="checkbox"/> Skin Absorption <input type="checkbox"/> Contact <input type="checkbox"/> Direct Penetration <input type="checkbox"/> Other:	<input type="checkbox"/> PID <input type="checkbox"/> 11.7 eV <input type="checkbox"/> 10.2 eV <input type="checkbox"/> OVM <input type="checkbox"/> CGI <input checked="" type="checkbox"/> OVA <input type="checkbox"/> _____
CAS No:	<input type="checkbox"/> Radioactive <input type="checkbox"/> Other	Incompatible With:		MP: -258°F		Symptoms: weakness, abdominal pain, gi bleeding, hepatomegmy, pallor or cyanosis of extremities	IP: 9.99 eV
Synonyms:				Sp. Gr.: NA			% Response: 35%
				Vap. D.: NA			
				Vap. P.: >1 ppm			
				H <sub>2</sub> O Sol.: 0.01% (77°F)			
		Other:					

# HEALTH AND SAFETY EVALUATION - 1 CHEMICAL HAZARDS

Hazardous Substance/Tasks	Physical Properties	Normal Physical State	State At Site/Proj. Temp.	Characteristics	Exposure Limits	Route(s) of Exposure/Symptoms	Monitoring Instruments/Ionization Potential + % Response
Xylenes (o-, m-, p-isomers)	<input type="checkbox"/> Explosive <input checked="" type="checkbox"/> Flammable <input type="checkbox"/> Corrosive <input type="checkbox"/> Reactive <input type="checkbox"/> Water Reactive <input type="checkbox"/> Oxidizer	<input type="checkbox"/> Solid <input checked="" type="checkbox"/> Liquid <input type="checkbox"/> Gas	<input type="checkbox"/> Solid <input checked="" type="checkbox"/> Liquid <input type="checkbox"/> Gas	pH: NA FP: 63/84/81 °F LEL: 1.1% UEL: 7.0% Auto. Ig.: NA BP: 292/269/281 °F	<input type="checkbox"/> CA <input checked="" type="checkbox"/> PEL 435 mg/m³ <input checked="" type="checkbox"/> TLV 655 mg/m³ <input checked="" type="checkbox"/> IDLH 1000 ppm <input type="checkbox"/> Only toxicological data available <input type="checkbox"/> Other:	<input checked="" type="checkbox"/> Inhalation <input checked="" type="checkbox"/> Ingestion <input checked="" type="checkbox"/> Skin Absorption <input checked="" type="checkbox"/> Contact <input type="checkbox"/> Direct Penetration <input type="checkbox"/> Other:	<input type="checkbox"/> PID <input type="checkbox"/> 11.7 eV <input type="checkbox"/> 10.2 eV <input type="checkbox"/> OVM <input type="checkbox"/> CGI <input checked="" type="checkbox"/> OVA <input type="checkbox"/> _____
CAS No: 1330-20-7	<input type="checkbox"/> Radioactive <input type="checkbox"/> Other	Incompatible With: Strong oxidizers		MP: NA		Symptoms: dizz, excitement, drow, inco, irrit eyes, nose, throat, enor, nau, vomit, stag. gait, corneal vacuolization, abdominal pain, derm.	IP: 8.56/8.56/ 8.44 eV  % Response: 111% (o) 116% (m) 116% (p)
Synonyms: 1,2-Dimethylbenzene o-Xylol 1,3-Dimethylbenzene m-Xylol 1,4-Dimethylbenzene p-Xylol			Sp. Gr.: 0.88/0.86/0.86				
			Vap. D.: NA				
			Vap. P.: 7 mm				
			H <sub>2</sub> O Sol.: Insoluble				
			Other:				



**ATTACHMENT "B"**

**MATERIAL SAFETY DATA SHEETS**

# BENZENE

BNZ

<b>Common Synonyms</b> Benzol Benzole	<b>Wettable solid</b> Colorless Gasoline-like odor  Flammable, volatile vapor is produced. Freezing point is 43°F.
...no contact with skin and vapor. Keep people away from vapors and self-contained breathing apparatus. ...of ignition sources and gas fire extinguishers. ...discharge of gas. ...upward and use water spray to knock down vapor. ...and remove discarded materials. ...local health and pollution control agencies.	
<b>Fire</b>	<b>FLAMMABLE.</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals, foam, or carbon dioxide. Vapor may be explosive on fire. Cool exposed containers with water.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID</b>  <b>VAPOR</b> Irritating to eyes, nose and throat. It causes, and causes reactions, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> Irritating to skin and eyes. May cause dermatitis. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyes open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	<b>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.</b> May be dangerous if it enters water streams. Notify local health and waste officials. Notify operators of nearby water intakes.
<b>1. RESPONSE TO DISCHARGE</b> (See Response Methods Handbook) Waste warning-high flammability Restrict access	<b>2. LABEL</b> 2.1 Category: Flammable liquid 2.2 Class: 3
<b>3. CHEMICAL DESIGNATIONS</b> 3.1 CG Compatibility Class: Aromatic hydrocarbon 3.2 Formula: C <sub>6</sub> H <sub>6</sub> 3.3 MSD/UN Designation: 3.2/1114 3.4 DOT ID No.: 1114 3.5 CAS Registry No.: 71-43-2	<b>4. OBSERVABLE CHARACTERISTICS</b> 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Aromatic; rather pleasant aromatic odor; characteristic odor
<b>5. HEALTH HAZARDS</b> 5.1 Personal Protective Equipment: Hydrocarbon vapor absorber, supplied air or a hose mask; hydrocarbon-resistant rubber or plastic gloves; chemical goggles or face splash shield; hydrocarbon-resistant boots such as neoprene. 5.2 Symptoms Following Exposure: Dizziness, excitation, pallor, followed by drowsiness, weakness, headache, breathlessness, chest constriction, coma and possible death. 5.3 Treatment of Exposure: SOG: Flush with water followed by soap and water; remove contaminated clothing and wash skin. EYES: Flush with plenty of water until vision outside. INHALATION: Remove from exposure immediately. Call a physician, if breathing is irregular or stopped, start resuscitation, administer oxygen. 5.4 Threshold Limit Value: 10 ppm 5.5 Short Term Exposure Limit: 75 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 3, LD <sub>50</sub> = 50 to 500 mg/kg 5.7 Lethal Toxicity: Lethal 5.8 Vapor (Gas) Irritant Characteristics: If present in high concentrations, vapors may cause irritation of eyes or respiratory system. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause staining and reddening of the skin. 5.10 Odor Threshold: 4 ppb 5.11 IDLH Value: 2,000 ppm	

<b>6. FIRE HAZARDS</b> 6.1 Flash Point: 12°F C.C. 6.2 Flammable Limits in Air: 1.3%-7.6% 6.3 Fire Extinguishing Agents: Dry chemicals, foam, or carbon dioxide 6.4 Fire Extinguishing Agents: Not to be used. Water may be ineffective. 6.5 Special Hazards of Combustion: Products: Not pertinent 6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: 1057°F 6.8 Classified Hazard: Class I, Group D 6.9 Burning Rate: 6.0 mm/min. 6.10 Auto-ignition Temperature: Data not available 6.11 Self-Heating: Air to Fuel Ratio: Data not available 6.12 Flash Temperature: Data not available	<b>10. HAZARD ASSESSMENT CODE</b> (See Hazard Assessment Handbook) A-T4J-V-W  <b>11. HAZARD CLASSIFICATIONS</b> 11.1 Code of Federal Regulations: Flammable liquid 11.2 HAS Hazard Rating for Bulk Water Transportation: Category Rating Fire: ..... 3 Health: ..... Vapor irritant: ..... 1 Liquid or Solid irritant: ..... 1 Poisons: ..... 3 Water Pollution: Human Toxicity: ..... 3 Aquatic Toxicity: ..... 1 Acute Effect: ..... 3 Reactivity: Other Chemicals: ..... 2 Water: ..... 1 Self Reaction: ..... 0 11.3 NFPA Hazard Classification: Category Classification Health Hazard (GHS): ..... 2 Flammability (GHS): ..... 3 Reactivity (GHS): ..... 0
<b>7. CHEMICAL REACTIVITY</b> 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Bases: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Initiator of Polymerization: Not pertinent 7.7 Oxidation: (Reactivity to) Products: Data not available 7.8 Reactivity Group: 32	<b>12. PHYSICAL AND CHEMICAL PROPERTIES</b> 12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 78.11 12.3 Boiling Point at 1 atm: 176°F = 80.1°C = 353.3°K 12.4 Freezing Point: 45°F = 5°C = 278.7°K 12.5 Critical Temperature: 682°F = 355.5°C = 628.7°K 12.6 Critical Pressure: 770 psi = 48.9 atm = 4.89 MPa/m <sup>2</sup> 12.7 Specific Gravity: 0.679 at 20°C (liquid) 12.8 Liquid Surface Tension: 28.0 dyne/cm = 0.028 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 35.0 dyne/cm = 0.035 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: 2.7 12.11 Ratio of Specific Heats of Vapor (GHS): 1.051 12.12 Latent Heat of Vaporization: 105 Btu/lb = 94.1 cal/g = 3.94 x 10 <sup>3</sup> J/kg 12.13 Heat of Combustion: -17,460 Btu/lb = -8080 cal/g = -40.0 x 10 <sup>3</sup> J/kg 12.14 Heat of Combustion: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.17 Heat of Fusion: 35.46 cal/g 12.18 Limiting Value: Data not available 12.19 Solid Vapor Pressure: 2.22 mm
<b>8. WATER POLLUTION</b> 8.1 Aquatic Toxicity: 5 ppm/5 hr/freshwater/acute/100 water 20 ppm/24 hr/freshwater/TL <sub>50</sub> /100 water 8.2 Waterfowl Toxicity: Data not available 8.3 Skeletal Oxygen Demand (BOD): 1.2 B/D, 10 days 8.4 Food Chain Concentration Potential: None	<b>NOTES</b>
<b>9. SHIPPING INFORMATION</b> 9.1 Grades of Purity: Industrial pure: ..... 99+ % Thiophene-free: ..... 99+ % Minimum: ..... 99+ % Industrial 90%: ..... 95+ % Reagent: ..... 99+ % 9.2 Storage Temperature: Open 9.3 Vent Atmosphere: No requirement 9.4 Venting Pressure: Vacuum	

# ETHYLBENZENE

ETB

<b>Common Synonyms</b> Phenyltoluene EB	<b>Liquid</b> Colorless Sweet, gasoline-like odor Floats on water. Flammable, irritating vapor is produced.
<b>First Aid</b> Avoid contact with liquid and vapor. Keep liquid away from eyes. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Stop discharge if possible. Stay upwind and use water spray to knock down vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.	
<b>Fire</b>	<b>FLAMMABLE.</b> Flashback along vapor trail may occur. Vapor may cause a flame to be produced and spread. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b> <b>VAPOR</b> Irritating to eyes, nose and throat. Vapor may cause dizziness or difficult breathing. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. <b>LIQUID</b> Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	<b>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.</b> Polluting to shorelines. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.
<b>1. RESPONSE TO DISCHARGE</b> (See Response Methods Handbook) Mechanical containment. Should be removed. Chemical and physical treatment.	<b>2. LABEL</b> 2.1 Category: Flammable liquid 2.2 Class: 3
<b>3. CHEMICAL DESIGNATIONS</b> 3.1 CO Compatibility Class: Aromatic hydrocarbon 3.2 Formula: C <sub>8</sub> H <sub>10</sub> 3.3 MSD/UN Designations: 2.3/1175 3.4 DOT ID No.: 1175 3.5 CAS Registry No.: 100-41-4	<b>4. OBSERVABLE CHARACTERISTICS</b> 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Aromatic
<b>5. HEALTH HAZARDS</b> 5.1 Personal Protective Equipment: Self-contained breathing apparatus; safety goggles. 5.2 Symptoms Following Exposure: Inhalation may cause irritation of nose, dizziness, depression. Moderate irritation of eye with corneal injury possible. Irritates skin and may cause blisters. 5.3 Treatment of Exposure: <b>INHALATION:</b> If ill effects occur, remove victim to fresh air, keep him warm and quiet, and get medical help promptly; if breathing stops, give artificial respiration. <b>INGESTION:</b> Induce vomiting only upon physician's approval; material in lung may cause chemical pneumonia. <b>SKIN AND EYES:</b> promptly flush with plenty of water (15 min. for eyes) and get medical attention; remove and wash contaminated clothing before reuse. 5.4 Threshold Limit Value: 100 ppm 5.5 Short Term Inhalation Limit: 200 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade II; LD <sub>50</sub> = 0.5 to 5 g/kg (rat) 5.7 Lethal Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Causes smearing of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure. 5.10 Odor Threshold: 140 ppm 5.11 IDLH Value: 2,000 ppm	

<b>6. FIRE HAZARDS</b> 6.1 Flash Point: 80°F O.C.; 59°F C.C. 6.2 Flammable Limits in Air: 1.0%-8.7% 6.3 Fire Extinguishing Agents: Foam (most effective), water fog, carbon dioxide or dry chemical. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion: Products: Irritating vapors are generated when heated. 6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to the source of ignition and flash back. 6.7 Ignition Temperature: 600°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 6.8 mm/min. 6.10 Adiabatic Flame Temperature: Data Not Available (Continued)	<b>10. HAZARD ASSESSMENT CODE</b> (See Hazard Assessment Handbook) A-T-U
<b>7. CHEMICAL REACTIVITY</b> 7.1 Reactivity With Water: No reaction 7.2 Reactivity With Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Bases: Not pertinent 7.5 Polymerizations: Not pertinent 7.6 Inhibitor of Polymerizations: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data Not Available 7.8 Reactivity Group: 32	<b>11. HAZARD CLASSIFICATIONS</b> 11.1 Code of Federal Regulations: Flammable liquid 11.2 NAB Hazard Rating for Bulk Water Transportation: Category Rating Fire 3 Health 2 Vapor Irritant 2 Liquid or Solid Irritant 2 Poisons 2 Water Pollution Human Toxicity 1 Aquatic Toxicity 3 Acute Effect 2 Reactivity Other Chemicals 1 Water 0 Self Reaction 0 11.3 NFPA Hazard Classifications: Category Classification Health Hazard (Blue) 2 Flammability (Red) 3 Reactivity (Yellow) 0
<b>8. WATER POLLUTION</b> 8.1 Aquatic Toxicity: 20 ppm/96 hr/bluegill/TL <sub>50</sub> /fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 2.8% (theor.), 5 days 8.4 Food Chain Concentration Potential: None	<b>12. PHYSICAL AND CHEMICAL PROPERTIES</b> 12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 106.17 12.3 Boiling Point at 1 atm: 136.1°F = 58.0°C = 408.4°K 12.4 Freezing Point: -139°F = -95°C = 178°K 12.5 Critical Temperature: 661.5°F = 345.3°C = 617.1°K 12.6 Critical Pressure: 523 psia = 35.8 atm = 3.61 MM/m <sup>2</sup> 12.7 Specific Gravity: 0.867 at 50°C (liquid) 12.8 Liquid Surface Tension: 29.8 dynes/cm = 0.0298 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 35.48 dynes/cm = 0.03548 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): 1.071 12.12 Latent Heat of Vaporization: 144 Btu/lb = 80.1 cal/g = 3.35 X 10 <sup>4</sup> J/kg 12.13 Heat of Combustion: -17,780 Btu/lb = -8077 cal/g = -413.5 X 10 <sup>4</sup> J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.17 Heat of Fusion: Data Not Available 12.18 Limiting Values: Data Not Available 12.19 Reid Vapor Pressure: 0.4 psia
<b>9. SHIPPING INFORMATION</b> 9.1 Grades of Purity: Research grade: 99.99%; pure grade: 99.5%; technical grade: 99.0% 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester) or pressure-vacuum	
<b>6. FIRE HAZARDS (Continued)</b> 6.11 Stoichiometric Air to Fuel Ratio: Data Not Available 6.12 Flame Temperature: Data Not Available	

# METHANE

MTH

Common Synonyms	Gas	Colorless	Weak odor
Marsh gas Marsh gas	Liquid floats and boils on water. Flammable vapor cloud is produced.		
STOP DISCHARGE IF POSSIBLE. IF NOT POSSIBLE, AWAY. Shut off ignition sources and call fire department. Stay upwind and use water spray to knock down vapor. Evacuate area in case of large discharge. Avoid contact with liquid and vapor. Notify local health and pollution control agencies.			
Fire	FLAMMABLE. Flashback along vapor trail may occur. May explode if ignited in an enclosed area. Stop discharge if possible. Cool exposed containers and protect men erecting shutoff with water. Let fire burn.		
Exposure	CALL FOR MEDICAL AID.  VAPOR Not irritating to eyes, nose or throat. If inhaled, we cause dizziness, difficult breathing, and loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID We cause frostbite. Push affected areas with plenty of water. DO NOT AFFECTED AREA.		
Water Pollution	Not harmful to aquatic life		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability Restrict access Evacuate area		2. LABEL 2.1 Category: Flammable gas 2.2 Class: 2	
3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Paraffin 3.2 Formula: CH <sub>4</sub> 3.3 IMO/UN Designation: 2.0/1971 3.4 DOT ID No: 1971 3.5 CAS Registry No: 74-82-8		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquefied gas 4.2 Color: Colorless 4.3 Odor: Mild, sweet	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus for high concentrations; protective clothing if exposed to liquid. 5.2 Symptoms Following Exposure: High concentrations may cause asphyxiation. No systemic effects, even at 5% concentration in air. 5.3 Treatment of Exposure: Remove to fresh air. Support respiration. 5.4 Threshold Limit Values: Not pertinent (methane is an asphyxiant, and limiting factor is available oxygen). 5.5 Short Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Not pertinent. 5.7 Lethal Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to the eyes and throat. 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin, because it evaporates quickly, but may cause some frostbite. 5.10 Odor Threshold: 200 ppm. 5.11 IDLH Values: Data not available.			

<p><b>6. FIRE HAZARDS</b></p> <p>6.1 Flash Point: Flammable gas</p> <p>6.2 Flammable Limits in Air: 5.0%-15.0%</p> <p>6.3 Fire Extinguishing Agents: Stop flow of gas</p> <p>6.4 Fire Extinguishing Agents Not to be Used: Water</p> <p>6.5 Special Hazards of Combustion Products: None</p> <p>6.6 Behavior in Fire: Not pertinent</p> <p>6.7 Ignition Temperature: 1004°F</p> <p>6.8 Electrical Hazard: Class I, Group D</p> <p>6.9 Burning Rate: 12.5 mm/min</p> <p>6.10 Adiabatic Flame Temperature: 2339 (Est.)</p> <p>6.11 Stoichiometric Air to Fuel Ratio: 17.16 (Est.)</p> <p>6.12 Flame Temperature: Data not available</p>	<p><b>10. HAZARD ASSESSMENT CODE</b></p> <p>(See Hazard Assessment Handbook)</p> <p><b>A-B-C-D-E-F-G</b></p>																																				
<p><b>7. CHEMICAL REACTIVITY</b></p> <p>7.1 Reactivity With Water: No reaction</p> <p>7.2 Reactivity With Common Materials: No reaction</p> <p>7.3 Stability During Transport: Stable</p> <p>7.4 Neutralizing Agents for Acids and Caustics: Not pertinent</p> <p>7.5 Polymerization: Not pertinent</p> <p>7.6 Initiator of Polymerization: Not pertinent</p> <p>7.7 Molar Ratio (Reactant to Product): Data not available</p> <p>7.8 Reactivity Group: 31</p>	<p><b>11. HAZARD CLASSIFICATIONS</b></p> <p>11.1 Code of Federal Regulations: Flammable gas</p> <p>11.2 HAS Hazard Rating for Bulk Water Transportation:</p> <table> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire.....</td><td>4</td></tr> <tr> <td>Health.....</td><td>0</td></tr> <tr> <td>Vapor Irritant.....</td><td>0</td></tr> <tr> <td>Liquid or Solid Irritant.....</td><td>0</td></tr> <tr> <td>Poisons.....</td><td>0</td></tr> <tr> <td>Water Pollution.....</td><td>0</td></tr> <tr> <td>Human Toxicity.....</td><td>0</td></tr> <tr> <td>Aquatic Toxicity.....</td><td>0</td></tr> <tr> <td>Aesthetic Effect.....</td><td>0</td></tr> <tr> <td>Reactivity.....</td><td>0</td></tr> <tr> <td>Other Chemicals.....</td><td>0</td></tr> <tr> <td>Water.....</td><td>0</td></tr> <tr> <td>Self Reaction.....</td><td>0</td></tr> </tbody> </table> <p>11.3 NFPA Hazard Classifications:</p> <table> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue).....</td><td>1</td></tr> <tr> <td>Flammability (Red).....</td><td>4</td></tr> <tr> <td>Reactivity (Yellow).....</td><td>0</td></tr> </tbody> </table>	Category	Rating	Fire.....	4	Health.....	0	Vapor Irritant.....	0	Liquid or Solid Irritant.....	0	Poisons.....	0	Water Pollution.....	0	Human Toxicity.....	0	Aquatic Toxicity.....	0	Aesthetic Effect.....	0	Reactivity.....	0	Other Chemicals.....	0	Water.....	0	Self Reaction.....	0	Category	Classification	Health Hazard (Blue).....	1	Flammability (Red).....	4	Reactivity (Yellow).....	0
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<p><b>8. WATER POLLUTION</b></p> <p>8.1 Aquatic Toxicity: None</p> <p>8.2 Waterway Toxicity: None</p> <p>8.3 Biological Oxygen Demand (BOD): None</p> <p>8.4 Food Chain Concentration Potential: None</p>	<p><b>12. PHYSICAL AND CHEMICAL PROPERTIES</b></p> <p>12.1 Physical State at 16°C and 1 atm: Gas</p> <p>12.2 Molecular Weight: 16.04</p> <p>12.3 Boiling Point at 1 atm: -258.7°F = -161.5°C = 111.7°K</p> <p>12.4 Freezing Point: -258.5°F = -162.5°C = 101.7°K</p> <p>12.5 Critical Temperature: -118.5°F = -82.5°C = 190.7°K</p> <p>12.6 Critical Pressure: 668 psia = 45.44 atm = 4.60 MN/m<sup>2</sup></p> <p>12.7 Specific Gravity: 0.422 at -100°C (liquid)</p> <p>12.8 Liquid Surface Tension: 14 dynes/cm = 0.014 N/m at -161°C</p> <p>12.9 Liquid Water Interfacial Tension (est.): 50 dynes/cm = 0.050 N/m at -161°C</p> <p>12.10 Vapor (Gas) Specific Gravity: 0.55 1.0</p> <p>12.11 Ratio of Specific Heats of Vapor (Gas): 1.306</p> <p>12.12 Latent Heat of Vaporization: 219.4 Btu/lb = 121.9 cal/g = 5.100 X 10<sup>4</sup> J/kg</p> <p>12.13 Heat of Combustion: -21.517 Btu/lb = -11,954 cal/g = -500.2 X 10<sup>4</sup> J/kg</p> <p>12.14 Heat of Decomposition: Not pertinent</p> <p>12.15 Heat of Solution: Not pertinent</p> <p>12.16 Heat of Polymerization: Not pertinent</p> <p>12.17 Heat of Fusion: 13.96 cal/g</p> <p>12.18 Limiting Values: Data not available</p> <p>12.19 Reid Vapor Pressure: Very high</p>																																				
<p><b>9. SHIPPING INFORMATION</b></p> <p>9.1 Grades of Purity: Research grade; pure grade</p> <p>9.2 Storage Temperature: -260°F</p> <p>9.3 Inert Atmosphere: No requirement</p> <p>9.4 Venting: Safety relief</p>	<p><b>NOTES</b></p>																																				

# TOLUENE

TOL

Common Synonyms		Watery liquid	Colorless	Pleasant odor
Toluol Methylbenzene Methylbenzol		Floats on water. Flammable, irritating vapor is produced.		
Stop discharge if possible. Keep people away. Shut off known sources and call for help. Stay upwind and use water spray to knock down vapor. Avoid contact with liquid and wash. Isolate and remove discharged material. Notify local health and pollution control agencies.				
Fire	FLAMMABLE. Flashback, strong vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.			
Exposure	CALL FOR MEDICAL AID. VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, vomiting, headache, dizziness, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing difficult, give oxygen. LIQUID Irritating to skin and eyes. If swallowed, will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, remove contact lenses and flush with plenty of water. IF SWALLOWED AND VICTIM IS CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.			
Water Pollution	Dangerous to aquatic life in high concentrations. Fouling to shrimp. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify responsible agency of water release.			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability. Evacuate area.		2. LABEL 2.1 Category: Flammable liquid 2.2 Class: 3		
3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Aromatic Hydrocarbon 3.2 Formula: C <sub>6</sub> H <sub>5</sub> CH <sub>3</sub> 3.3 ISO/UN Designations: 3.2/1204 3.4 DOT ID No.: 1204 3.5 CAS Registry No.: 108-88-3		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Pungent, aromatic, benzene-like, distinct, pleasant		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Air-supplied mask; goggles or face shield; plastic gloves. 5.2 Symptoms Following Exposure: Vapors irritate eyes and upper respiratory tract; cause dizziness, headache, weakness, respiratory arrest. Liquid irritates eyes and causes drying of skin, if absorbed, causes coughing, gagging, distress, and rapidly developing pulmonary edema, if ingested causes vomiting, griping, diarrhea, depressed respiration. 5.3 Treatment of Exposure: INHALATION: remove to fresh air, give artificial respiration and oxygen if needed; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water. 5.4 Threshold Limit Value: 100 ppm 5.5 Short Term Inhalation Limit: 600 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 2; LD <sub>50</sub> = 0.5 to 5 g/kg 5.7 Late Toxicity: Kidney and liver damage may follow ingestion. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight irritating of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause irritating and reddening of the skin. 5.10 Odor Threshold: 0.17 ppm 5.11 IDLH Value: 2,000 ppm				

<b>6. FIRE HAZARDS</b> 6.1 Flash Point: 40°F C.C.; 55°F O.C. 6.2 Flammable Limits in Air: 1.27%-7% 6.3 Fire Extinguishing Agents: Carbon dioxide or dry chemical for small fires, ordinary foam for large fires. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion: Products: Not pertinent. 6.6 Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: 907°F 6.8 Electrical Hazard: Class I, Group D 6.9 Burning Rate: 5.7 mm/min. 6.10 Autoxidation Temperature: Data not available  (Continued)		<b>10. HAZARD ASSESSMENT CODE</b> (See Hazard Assessment Handbook) <b>A-T-U</b>																																					
<b>7. CHEMICAL REACTIVITY</b> 7.1 Reactivity With Water: No reaction 7.2 Reactivity With Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 32		<b>11. HAZARD CLASSIFICATIONS</b> 11.1 Code of Federal Regulations: Flammable liquid 11.2 NAB Hazard Rating for Bulk Water Transportation: <table><tr><th>Category</th><th>Rating</th></tr><tr><td>Fire</td><td>3</td></tr><tr><td>Health</td><td></td></tr><tr><td>Vapor Irritant</td><td>1</td></tr><tr><td>Liquid or Solid Irritant</td><td>1</td></tr><tr><td>Poisons</td><td>2</td></tr><tr><td>Water Pollution</td><td></td></tr><tr><td>Human Toxicity</td><td>1</td></tr><tr><td>Aquatic Toxicity</td><td>3</td></tr><tr><td>Aesthetic Effect</td><td>2</td></tr><tr><td>Reactivity</td><td></td></tr><tr><td>Other Chemicals</td><td>1</td></tr><tr><td>Water</td><td>0</td></tr><tr><td>Self Reaction</td><td>0</td></tr></table> 11.3 NFPA Hazard Classification: <table><tr><th>Category</th><th>Classification</th></tr><tr><td>Health Hazard (Blue)</td><td>2</td></tr><tr><td>Flammability (Red)</td><td>3</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></table>		Category	Rating	Fire	3	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	2	Water Pollution		Human Toxicity	1	Aquatic Toxicity	3	Aesthetic Effect	2	Reactivity		Other Chemicals	1	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	0
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<b>8. WATER POLLUTION</b> 8.1 Aquatic Toxicity: 1180 mg/l/96 hr/sunfish/TL <sub>50</sub> /fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 0%, 5 days; 35% (theor), 6 days 8.4 Food Chain Concentration Potential: None		<b>12. PHYSICAL AND CHEMICAL PROPERTIES</b> 12.1 Physical State at 18°C and 1 atm: Liquid 12.2 Molecular Weight: 92.14 12.3 Boiling Point at 1 atm: 231.1°F = 116.2°C = 389.8°K 12.4 Freezing Point: -139°F = -95.0°C = 178.2°K 12.5 Critical Temperature: 605.4°F = 318.6°C = 591.8°K 12.6 Critical Pressure: 508.1 psi = 40.55 atm = 4,100 MN/m <sup>2</sup> 12.7 Specific Gravity: 0.867 at 20°C (liquid) 12.8 Liquid Surface Tension: 29.9 dynes/cm = 0.0299 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 35.1 dynes/cm = 0.0351 N/m at 25°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): 1.089 12.12 Latent Heat of Vaporization: 155 Btu/lb = 65.1 cal/g = 3.81 X 10 <sup>4</sup> J/kg 12.13 Heat of Combustion: -17,430 Btu/lb = -8086 cal/g = -405.5 X 10 <sup>4</sup> J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.18 Heat of Fusion: 17.17 cal/g 12.19 Limiting Values: Data not available 12.20 Reid Vapor Pressure: 1.1 psi																																					
<b>9. SHIPPING INFORMATION</b> 9.1 Grades of Purity: Research, reagent, reagent-grade 99.8 + %; industrial contains 94 + %, with 5% xylene and small amounts of benzene and nonaromatic hydrocarbons; 90/120 less pure than industrial. 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open flame arrestor or pressure-vacuum		<b>6. FIRE HAZARDS (Continued)</b> 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available																																					

# VINYL CHLORIDE

VCM

Common Synonyms	Gas	Colorless	Sweet odor
Chloroethylene VCL Vinyl C Monomer VCM	Liquid floats and boils on water. Flammable, emitting visible vapor cloud is produced.		
In case of discharge if possible. Keep people away. Cut off ignition sources and call fire department. Evacuate area and use water spray to knock down vapor. Evacuate area in case of large discharge. Avoid contact with liquid and vapor. Notify local health and pollution control agencies.			
Fire	FLAMMABLE. POISONOUS GAS IS PRODUCED IN FIRE. Flashback along vapor trail may occur. May explode if ignited in an enclosed area. Wear self-contained breathing apparatus. Cool exposed containers and protect men entering shut-off with water. Stop flow of gas if possible. Let fire burn. Extinguish small fires with dry chemicals.		
Exposure	CALL FOR MEDICAL AID  VAPOR Irritating to eyes, nose, and throat. If inhaled, will cause dizziness or difficulty breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will cause frostbite. Flush affected areas with plenty of water. DO NOT RUB AFFECTED AREAS.		
Water Pollution	Not harmful to aquatic life.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability. Evacuate area.		2. LABEL 2.1 Category: Flammable gas 2.2 Class: 2	
3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Vinyl halides 3.2 Formula: CH <sub>2</sub> =CHCl 3.3 IMO/UN Designation: 2.0/1000 3.4 DOT ID No.: 1088 3.5 CAS Registry No.: 75-01-4		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquefied compressed gas 4.2 Color: Colorless 4.3 Odor: Pleasant, sweet	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Rubber gloves and shoes; gas-tight goggles; organic vapor canister or self-contained breathing apparatus. 5.2 Symptoms Following Exposure: INHALATION: High concentrations cause dizziness, anesthesia, lung irritation. SKIN: may cause frostbite; phenol inhibitor may be absorbed through skin if large amounts of liquid evaporate. 5.3 Treatment of Exposure: INHALATION: remove patient to fresh air and keep him quiet and warm; call a doctor; give artificial respiration if breathing stops. EYES AND SKIN: Flush with plenty of water for at least 15 min.; for eyes, get medical attention; remove contaminated clothing. 5.4 Threshold Limit Value: 5 ppm 5.5 Short Term Exposure Limit: 500 ppm for 5 min. 5.6 Toxicity by Ingestion: Not pertinent 5.7 Late Toxicity: Chronic exposure may cause liver damage. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smearing and reddening of skin. May cause frostbite. 5.10 Odor Threshold: 200 ppm 5.11 IDLH Value: Data not available			

<p><b>6. FIRE HAZARDS</b></p> <p>6.1 Flash Point: <math>-110^{\circ}\text{F}</math> O.C.</p> <p>6.2 Flammable Limits in Air: 4%-26%</p> <p>6.3 Fire Extinguishing Agents: For small fires use dry chemical or carbon dioxide. For large fires stop flow of gas. Cool exposed containers with water.</p> <p>6.4 Fire Extinguishing Agents Not to be Used: Not pertinent</p> <p>6.5 Special Hazards of Combustion: Products: Forms highly toxic combustion products such as hydrogen chloride, phosgene, and carbon monoxide.</p> <p>6.6 Behavior in Fire: Containers may explode in fire. Gas is heavier than air and may travel considerable distance to a source of ignition and flash back.</p> <p>6.7 Ignition Temperature: <math>662^{\circ}\text{F}</math></p> <p>6.8 Electrical Hazard: Class I, Group D</p> <p>6.9 Burning Rate: 4.3 mm/min. (Continued)</p>	<p><b>10. HAZARD ASSESSMENT CODE</b> (See Hazard Assessment Handbook) <b>A-B-C-D-E-F-G-Z</b></p>																																				
<p><b>7. CHEMICAL REACTIVITY</b></p> <p>7.1 Reactivity With Water: No reaction</p> <p>7.2 Reactivity With Common Materials: No reaction</p> <p>7.3 Stability During Transport: Stable</p> <p>7.4 Neutralizing Agents for Acids and Caustics: Not pertinent</p> <p>7.5 Polymerization: Polymerizes in presence of air, sunlight, or heat unless stabilized by inhibitors.</p> <p>7.6 Inhibitor of Polymerization: Not normally used except when high temperatures are expected. Then 40-100 ppm of phenol used.</p> <p>7.7 Molar Ratio (Reactant to Product): Data not available</p> <p>7.8 Reactivity Group: 35</p>	<p><b>11. HAZARD CLASSIFICATIONS</b></p> <p>11.1 Code of Federal Regulations: Flammable gas</p> <p>11.2 NAS Hazards Rating for Bulk Water Transportation</p> <table> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>4</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td>Vapor Irritant</td><td>2</td></tr> <tr> <td>Liquid or Solid Irritant</td><td>1</td></tr> <tr> <td>Poisons</td><td>2</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td>Human Toxicity</td><td>0</td></tr> <tr> <td>Aquatic Toxicity</td><td>0</td></tr> <tr> <td>Anesthetic Effect</td><td>0</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td>Other Chemicals</td><td>2</td></tr> <tr> <td>Water</td><td>0</td></tr> <tr> <td>Self Reaction</td><td>2</td></tr> </tbody> </table> <p>11.3 NFPA Hazard Classification</p> <table> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>2</td></tr> <tr> <td>Flammability (Red)</td><td>4</td></tr> <tr> <td>Reactivity (Yellow)</td><td>1</td></tr> </tbody> </table>	Category	Rating	Fire	4	Health		Vapor Irritant	2	Liquid or Solid Irritant	1	Poisons	2	Water Pollution		Human Toxicity	0	Aquatic Toxicity	0	Anesthetic Effect	0	Reactivity		Other Chemicals	2	Water	0	Self Reaction	2	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	4	Reactivity (Yellow)	1
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<p><b>8. WATER POLLUTION</b></p> <p>8.1 Aquatic Toxicity: None</p> <p>8.2 Waterway Toxicity: None</p> <p>8.3 Biological Oxygen Demand (BOD): None</p> <p>8.4 Food Chain Concentration Potential: None</p>	<p><b>12. PHYSICAL AND CHEMICAL PROPERTIES</b></p> <p>12.1 Physical State at <math>15^{\circ}\text{C}</math> and 1 atm: Gas</p> <p>12.2 Molecular Weight: 62.50</p> <p>12.3 Boiling Point at 1 atm: <math>7.2^{\circ}\text{F} = 13.6^{\circ}\text{C} = 258.4^{\circ}\text{K}</math></p> <p>12.4 Freezing Point: <math>-344.6^{\circ}\text{F} = -183.6^{\circ}\text{C} = -118.4^{\circ}\text{K}</math></p> <p>12.5 Critical Temperature: <math>317.1^{\circ}\text{F} = 158.4^{\circ}\text{C} = 431.6^{\circ}\text{K}</math></p> <p>12.6 Critical Pressure: 776 psia = 52.7 atm = 5.34 MN/m<sup>2</sup></p> <p>12.7 Specific Gravity: 0.989 at <math>-13^{\circ}\text{C}</math> (liquid)</p> <p>12.8 Liquid Surface Tension: 16.0 dynes/cm = 0.0160 N/m at <math>25^{\circ}\text{C}</math></p> <p>12.9 Liquid Water Interfacial Tension: (est.) 30 dynes/cm = 0.03 N/m at <math>20^{\circ}\text{C}</math></p> <p>12.10 Vapor (Gas) Specific Gravity: 2.2</p> <p>12.11 Ratio of Specific Heats of Vapor (Gas): 1.186</p> <p>12.12 Latent Heat of Vaporization: 160 Btu/lb = 88 cal/g = <math>3.7 \times 10^4</math> J/kg</p> <p>12.13 Heat of Combustion: <math>-6136</math> Btu/lb = <math>-4539</math> cal/g = <math>-189.1 \times 10^4</math> J/kg</p> <p>12.14 Heat of Decomposition: Not pertinent</p> <p>12.15 Heat of Solution: Not pertinent</p> <p>12.16 Heat of Polymerization: <math>-729</math> Btu/lb = <math>-405</math> cal/g = <math>-16.9 \times 10^4</math> J/kg</p> <p>12.25 Heat of Fusion: 18.14 cal/g</p> <p>12.26 Limiting Values: Data not available</p> <p>12.27 Reid Vapor Pressure: 75 psia</p>																																				
<p><b>9. SHIPPING INFORMATION</b></p> <p>9.1 Grades of Purity: Commercial or technical 99+%</p> <p>9.2 Storage Temperature: Under pressure; ambient at atm. pressure; low</p> <p>9.3 Inert Atmosphere: No requirement</p> <p>9.4 Venting: Under pressure; safety relief at atm. pressure; pressure-vacuum</p>	<p><b>6. FIRE HAZARDS (Continued)</b></p> <p>6.10 Adiabatic Flame Temperature: Data not available</p> <p>6.11 Stoichiometric Air to Fuel Ratio: 5.490 (Est.)</p> <p>6.12 Flame Temperature: Data not available</p>																																				

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# m-XYLENE

XLm

<b>Common Synonyms</b> 1, 3-Dimethylbenzene Xyl		<b>Watery liquid</b>  <b>Colorless</b>  <b>Sweet odor</b>  Floats on water. Flammable, irritating vapor is produced.
Stop discharge if possible. Keep people away. Call fire department. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.		
<b>Fire</b>	<b>FLAMMABLE</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear self-contained breathing apparatus. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.	
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b>  <b>VAPOR</b> Irritating to eyes, nose, and throat. If inhaled, will cause headache, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> Irritating to skin and eyes. If swallowed, will cause nausea, vomiting, or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. <b>DO NOT INDUCE VOMITING.</b>	
<b>Water Pollution</b>	<b>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.</b> Floating to shoreline. May be dangerous if it enters water intakes.  Notify local health and wildlife officials. Notify operators of nearby water intakes.	
<b>1. RESPONSE TO DISCHARGE</b> (See Response Methods Handbook) Issue warning-high flammability Evacuate area Should be removed Chemical and physical treatment		<b>2. LABEL</b>  2.1 Category: Flammable liquid 2.2 Class: 3
<b>3. CHEMICAL DESIGNATIONS</b>  3.1 CG Compatibility Class: Aromatic Hydrocarbon 3.2 Formula: $m\text{-C}_8\text{H}_{10}$ 3.3 MSD/ULI Designation: 3.2/1307 3.4 DOT ID No.: 1307 3.5 CAS Registry No.: 106-36-3		<b>4. OBSERVABLE CHARACTERISTICS</b>  4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Like benzene; characteristic aromatic
<b>5. HEALTH HAZARDS</b>  5.1 Personal Protective Equipment: Approved canister or air-supplied mask; goggles or face shield; plastic gloves and boots. 5.2 Symptoms Following Exposure: Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress, and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache, and coma; can be fatal. Kidney and liver damage can occur. 5.3 Treatment of Exposure: <b>INHALATION:</b> remove to fresh air; administer artificial respiration and oxygen if required; call a doctor. <b>INGESTION:</b> do NOT induce vomiting; call a doctor. <b>EYES:</b> flush with water for at least 15 min. <b>SKIN:</b> wipe off, wash with soap and water. 5.4 Threshold Limit Value: 100 ppm 5.5 Short Term Inhalation Limit: 300 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 3; LD <sub>50</sub> = 50 to 500 g/kg 5.7 Late Toxicity: Kidney and liver damage. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight stinging of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause stinging and reddening of the skin. 5.10 Odor Threshold: 0.05 ppm 5.11 IDLH Value: 10,000 ppm		

<div>6. FIRE HAZARDS</div> <div><div>6.1 Flash Point: 94°F C.C.</div><div>6.2 Flammable Limits in Air: 1.1%-6.4%</div><div>6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide</div><div>6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective.</div><div>6.5 Special Hazards of Combustion Products: Not pertinent</div><div>6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.</div><div>6.7 Ignition Temperature: 965°F</div><div>6.8 Electrical Hazards: Class I, Group D</div><div>6.9 Burning Rate: 5.5 mm/min.</div><div>6.10 Adiabatic Flame Temperature: Data not available</div><div>6.11 Stoichiometric Air to Fuel Ratio: Data not available</div><div>6.12 Flame Temperature: Data not available</div></div>	<div>10. HAZARD ASSESSMENT CODE</div> <div>(See Hazard Assessment Handbook)</div> <div>A-T-U</div>																																				
<div>7. CHEMICAL REACTIVITY</div> <div><div>7.1 Reactivity With Water: No reaction</div><div>7.2 Reactivity With Common Materials: No reaction</div><div>7.3 Stability During Transport: Stable</div><div>7.4 Neutralizing Agents for Acids and Bases: Not pertinent</div><div>7.5 Polymerizations: Not pertinent</div><div>7.6 Initiator of Polymerization: Not pertinent</div><div>7.7 Water Ratio (Reactive to Products): Data not available</div><div>7.8 Reactivity Group: 32</div></div>	<div>11. HAZARD CLASSIFICATIONS</div> <div><div>11.1 Code of Federal Regulations: Flammable Liquid</div><div>11.2 NAB Hazard Rating for Bulk Water Transportation:<table><tr><th>Category</th><th>Rating</th></tr><tr><td>Fire</td><td>3</td></tr><tr><td>Health</td><td></td></tr><tr><td>Vapor Irritant</td><td>1</td></tr><tr><td>Liquid or Solid Irritant</td><td>1</td></tr><tr><td>Poisons</td><td>2</td></tr><tr><td>Water Pollution</td><td></td></tr><tr><td>Human Toxicity</td><td>1</td></tr><tr><td>Aquatic Toxicity</td><td>3</td></tr><tr><td>Anesthetic Effect</td><td>2</td></tr><tr><td>Reactivity</td><td></td></tr><tr><td>Other Chemicals</td><td>1</td></tr><tr><td>Water</td><td>0</td></tr><tr><td>Self Reaction</td><td>0</td></tr></table></div><div>11.3 NFPA Hazard Classifications:<table><tr><th>Category</th><th>Classification</th></tr><tr><td>Health Hazard (Blue)</td><td>2</td></tr><tr><td>Flammability (Red)</td><td>3</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></table></div></div>	Category	Rating	Fire	3	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	2	Water Pollution		Human Toxicity	1	Aquatic Toxicity	3	Anesthetic Effect	2	Reactivity		Other Chemicals	1	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	0
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<div>8. WATER POLLUTION</div> <div><div>8.1 Aquatic Toxicity: 22 ppm/96 hr/bluegill/TL<sub>100</sub>/fresh water</div><div>8.2 Waterfowl Toxicity: Data not available</div><div>8.3 Biological Oxygen Demand (BOD): 0 lb/lb, 5 days; 0% (theor.), 8 days</div><div>8.4 Food Chain Concentration Potential: Data not available</div></div>	<div>12. PHYSICAL AND CHEMICAL PROPERTIES</div> <div><div>12.1 Physical State at 15°C and 1 atm: Liquid</div><div>12.2 Molecular Weight: 106.16</div><div>12.3 Boiling Point at 1 atm: 288.4°F = 131.6°C = 405.1°K</div><div>12.4 Freezing Point: -64.5°F = -47.5°C = 225.5°K</div><div>12.5 Critical Temperature: 650.5°F = 343.5°C = 617.0°K</div><div>12.6 Critical Pressure: 613.8 atm = 34.85 psia = 3.540 MPa</div><div>12.7 Specific Gravity: 0.894 at 20°C (liquid)</div><div>12.8 Liquid Surface Tension: 28.6 dynes/cm = 0.0286 N/m at 20°C</div><div>12.9 Liquid Water Interfacial Tension: 36.4 dynes/cm = 0.0364 N/m at 30°C</div><div>12.10 Vapor (Gas) Specific Gravity: Not pertinent</div><div>12.11 Ratio of Specific Heats of Vapor (Gas): 1.071</div><div>12.12 Latent Heat of Vaporization: 147 Btu/lb = 61.9 cal/g = 3.43 X 10<sup>4</sup> J/kg</div><div>12.13 Heat of Combustion: -17,554 Btu/lb = -8752.4 cal/g = -408.31 X 10<sup>4</sup> J/kg</div><div>12.14 Heat of Decomposition: Not pertinent</div><div>12.15 Heat of Solution: Not pertinent</div><div>12.16 Heat of Polymerization: Not pertinent</div><div>12.20 Heat of Fusion: 25.01 cal/g</div><div>12.25 Limiting Values: Data not available</div><div>12.27 Reid Vapor Pressure: 0.34 psia</div></div>																																				
<div>9. SHIPPING INFORMATION</div> <div><div>9.1 Grades of Purity: Research: 99.99%; Pure: 99.9%; Technical: 99.2%</div><div>9.2 Storage Temperature: Ambient</div><div>9.3 Inert Atmosphere: No requirement</div><div>9.4 Venting: Open (flame arrester) or pressure-vacuum</div></div>																																					

NOTES

## XLO

Common Synonyms 1, 2-Dimethylbenzene Xylol		Watery liquid Flammable Releases toxic and/or irritating vapor if produced.	Colorless Sweet odor
Skin discharge is possible. Keep people away. Call fire department. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.			
Fire	<b>FLAMMABLE</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear self-contained breathing apparatus. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
Exposure	<b>CALL FOR MEDICAL AID.</b> <b>VAPOR</b> Irritating to eyes, nose and throat. If inhaled, will cause headache, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. <b>LIQUID</b> Irritating to skin and eyes. If swallowed, will cause nausea, vomiting, or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. <b>DO NOT INDUCE VOMITING.</b>		
Water Pollution	Dangerous to aquatic life in high concentrations. Foul to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		
<b>1. RESPONSE TO DISCHARGE</b> (See Response Methods Handbook) Issue warning-high flammability Evacuate area Should be removed Chemical and physical treatment		<b>2. LABEL</b> 2.1 Category: Flammable liquid 2.2 Class: 3	
<b>3. CHEMICAL DESIGNATIONS</b> 3.1 CG Compatibility Class: Aromatic Hydrocarbon 3.2 Formula: $\text{C}_8\text{H}_{10}$ 3.3 MSD/UN Designation: 3.2/1307 3.4 DOT ID No.: 1307 3.5 CAS Registry No.: 95-47-6		<b>4. OBSERVABLE CHARACTERISTICS</b> 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Benzene-like; characteristic aromatic	
<b>5. HEALTH HAZARDS</b>			
5.1 Personal Protective Equipment: Approved canister or air-supplied mask; goggles or face shield; plastic gloves and boots. 5.2 Symptoms Following Exposure: Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress, and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache, and coma. Can be fatal. Kidney and liver damage can occur. 5.3 Treatment of Exposure: <b>INHALATION:</b> remove to fresh air; administer artificial respiration and oxygen if required; call a doctor. <b>INGESTION:</b> do NOT induce vomiting; call a doctor. <b>EYES:</b> flush with water for at least 15 min. <b>SKIN:</b> wipe off, wash with soap and water. 5.4 Threshold Limit Value: 100 ppm 5.5 Short Term Inhalation Limit: 300 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 3; LD <sub>50</sub> = 50 to 500 mg/kg 5.7 Late Toxicity: Kidney and liver damage. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight stinging of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause stinging and reddening of the skin. 5.10 Odor Threshold: 0.05 ppm 5.11 IDLH Value: 10,000 ppm			

<b>8. FIRE HAZARDS</b>	<b>10. HAZARD ASSESSMENT CODE</b> (See Hazard Assessment Handbook) <b>A-T-U</b>																																				
<b>6.1</b> Flash Point: 63°F C.C.; 75°F O.C. <b>6.2</b> Flammable Limits in Air: 1.1%-7.0% <b>6.3</b> Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide <b>6.4</b> Fire Extinguishing Agents Not to be Used: Water may be ineffective. <b>6.5</b> Special Hazards of Combustion Products: Not pertinent <b>6.6</b> Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. <b>6.7</b> Ignition Temperature: 600°F <b>6.8</b> Electrical Hazard: Class I, Group D <b>6.9</b> Burning Rate: 0.5 mm/min. <b>6.10</b> Adiabatic Flame Temperature: Data not available <b>6.11</b> Stoichiometric Air to Fuel Ratio: Data not available <b>6.12</b> Flame Temperature: Data not available	<b>11. HAZARD CLASSIFICATIONS</b> <b>11.1</b> Code of Federal Regulations: Flammable liquid <b>11.2</b> HAS Hazard Rating for Bulk Water Transportation: <table style="width: 100%; border: none;"> <tr> <th style="text-align: center;">Category</th> <th style="text-align: center;">Rating</th> </tr> <tr> <td>Fire _____</td> <td style="text-align: center;">3</td> </tr> <tr> <td>Health _____</td> <td></td> </tr> <tr> <td>Vapor Irritant _____</td> <td style="text-align: center;">1</td> </tr> <tr> <td>Liquid or Solid Irritant _____</td> <td style="text-align: center;">1</td> </tr> <tr> <td>Poisons _____</td> <td style="text-align: center;">2</td> </tr> <tr> <td>Water Pollution _____</td> <td></td> </tr> <tr> <td>Human Toxicity _____</td> <td style="text-align: center;">1</td> </tr> <tr> <td>Aquatic Toxicity _____</td> <td style="text-align: center;">3</td> </tr> <tr> <td>Aesthetic Effect _____</td> <td style="text-align: center;">2</td> </tr> <tr> <td>Reactivity _____</td> <td></td> </tr> <tr> <td>Other Chemicals _____</td> <td style="text-align: center;">1</td> </tr> <tr> <td>Water _____</td> <td style="text-align: center;">0</td> </tr> <tr> <td>Self Reaction _____</td> <td style="text-align: center;">0</td> </tr> </table> <b>11.3</b> NFPA Hazard Classifications: <table style="width: 100%; border: none;"> <tr> <th style="text-align: center;">Category</th> <th style="text-align: center;">Classification</th> </tr> <tr> <td>Health Hazard (Blue) _____</td> <td style="text-align: center;">2</td> </tr> <tr> <td>Flammability (Red) _____</td> <td style="text-align: center;">3</td> </tr> <tr> <td>Reactivity (Yellow) _____</td> <td style="text-align: center;">0</td> </tr> </table>	Category	Rating	Fire _____	3	Health _____		Vapor Irritant _____	1	Liquid or Solid Irritant _____	1	Poisons _____	2	Water Pollution _____		Human Toxicity _____	1	Aquatic Toxicity _____	3	Aesthetic Effect _____	2	Reactivity _____		Other Chemicals _____	1	Water _____	0	Self Reaction _____	0	Category	Classification	Health Hazard (Blue) _____	2	Flammability (Red) _____	3	Reactivity (Yellow) _____	0
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<b>7. CHEMICAL REACTIVITY</b> <b>7.1</b> Reactivity With Water: No reaction <b>7.2</b> Reactivity With Common Materials: No reaction <b>7.3</b> Stability During Transport: Stable <b>7.4</b> Neutralizing Agents for Acids and Corrosives: Not pertinent <b>7.5</b> Polymerizations: Not pertinent <b>7.6</b> Inhibitor of Polymerization: Not pertinent <b>7.7</b> Molar Ratio (Reactant to Product): Data not available <b>7.8</b> Reactivity Group: 32	<b>12. PHYSICAL AND CHEMICAL PROPERTIES</b> <b>12.1</b> Physical State at 18°C and 1 atm: Liquid <b>12.2</b> Molecular Weight: 108.16 <b>12.3</b> Boiling Point at 1 atm: 291.8°F = 144.4°C = 417.6°K <b>12.4</b> Freezing Point: -13.5°F = -25.3°C = 248.0°K <b>12.5</b> Critical Temperature: 674.6°F = 357.1°C = 630.3°K <b>12.6</b> Critical Pressure: 541.5 atm = 35.84 pole = 2.732 MN/m <sup>2</sup> <b>12.7</b> Specific Gravity: 0.880 at 20°C (liquid) <b>12.8</b> Liquid Surface Tension: 30.53 dynes/cm = 0.00053 N/m at 15.5°C <b>12.9</b> Liquid Water Vaporization Tension: 30.06 dynes/cm = 0.00006 N/m at 25°C <b>12.10</b> Vapor (Gas) Specific Gravity: Not pertinent <b>12.11</b> Ratio of Specific Heats of Vapor (Gas): 1.068 <b>12.12</b> Latent Heat of Vaporization: 149 Btu/lb = 62.9 cal/g = 3.47 X 10 <sup>3</sup> J/kg <b>12.13</b> Heat of Combustion: -17,558 Btu/lb = -8784.7 cal/g = -408.61 X 10 <sup>3</sup> J/kg <b>12.14</b> Heat of Decomposition: Not pertinent <b>12.15</b> Heat of Solution: Not pertinent <b>12.16</b> Heat of Polymerization: Not pertinent <b>12.17</b> Heat of Fusion: 30.84 cal/g <b>12.18</b> Limiting Values: Data not available <b>12.19</b> Reid Vapor Pressure: 0.25 pole																																				
<b>9. WATER POLLUTION</b> <b>9.1</b> Aquatic Toxicity: >100 mg/l/96 hr/D. magna/TL <sub>50</sub> /fresh water <b>9.2</b> Waterfowl Toxicity: Data not available <b>9.3</b> Biological Oxygen Demand (BOD): 0 lb/lb. 5 days; 2.5% (Theor.), 5 days <b>9.4</b> Food Chain Concentration Potential: Data not available																																					
<b>9. SHIPPING INFORMATION</b> <b>9.1</b> Grades of Purity: Research: 99.99%; Pure: 99.7%; Commercial: 95+% <b>9.2</b> Storage Temperature: Ambient <b>9.3</b> Inert Atmosphere: No reaction <b>9.4</b> Venting: Open (Rime arrester) or pressure-vacuum																																					

NOTES



# p-XYLENE

XLP

<b>Common Synonyms</b> 1, 4-Dimethylbenzene Xylol		<b>Watery liquid</b>  <b>Colorless</b>  <b>Sweet odor</b>  Floats on water. Flammable, smothering vapor is produced. Freezing point is 56°F.
Stop discharge if possible. Keep people away. Call fire department. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.		
<b>Fire</b>	<b>FLAMMABLE</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear self-contained breathing apparatus. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.	
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b> <b>VAPOR</b> Irritating to eyes, nose and throat. If inhaled, will cause dizziness, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. <b>LIQUID</b> Irritating to skin and eyes. If swallowed, will cause nausea, vomiting, loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. <b>DO NOT INDUCE VOMITING.</b>	
<b>Water Pollution</b>	<b>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.</b> Fouling to streams. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	
<b>1. RESPONSE TO DISCHARGE</b> (See Response Methods Handbook) Issue warning-high flammability Evacuate area Should be removed Chemical and physical treatment		<b>2. LABEL</b> 2.1 Category: Flammable liquid 2.2 Class 3
<b>3. CHEMICAL DESIGNATIONS</b> 3.1 CG Compatibility Class: Aromatic Hydrocarbon 3.2 Formula: $p-C_6H_4(CH_3)_2$ 3.3 MSD/UN Designation: 3.2/1307 3.4 DOT ID No.: 1307 3.5 CAS Registry No.: 106-42-3		<b>4. OBSERVABLE CHARACTERISTICS</b> 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Like benzene; characteristic aromatic
<b>5. HEALTH HAZARDS</b> 5.1 Personal Protective Equipment: Approved canister or air-supplied mask; goggles or face shield; plastic gloves and boots. 5.2 Symptoms Following Exposure: Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress, and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache, and coma. Can be fatal. Kidney and liver damage can occur. 5.3 Treatment of Exposure: <b>INHALATION:</b> remove to fresh air; administer artificial respiration and oxygen if required; call a doctor. <b>INGESTION:</b> do NOT induce vomiting; call a doctor. <b>EYES:</b> flush with water for at least 15 min. <b>SKIN:</b> wipe off, wash with soap and water. 5.4 Threshold Limit Value: 100 ppm 5.5 Short Term Inhalation Limit: 300 ppm for 30 min. 5.6 LD <sub>50</sub> by Ingestion: Grade 3; LD <sub>50</sub> = 50 to 500 mg/kg 5.7 Toxicity: Kidney and liver damage. 5.8 Irritant Characteristics: Vapors cause a slight stinging of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause stinging and reddening of the skin. 5.10 Odor Threshold: 0.05 ppm 5.11 IDLH Value: 10,000 ppm		

<div>6. FIRE HAZARDS</div> <div>6.1 Flash Point: 81°F C.C.</div> <div>6.2 Flammable Limits in Air: 1.1%-6.6%</div> <div>6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide</div> <div>6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective.</div> <div>6.5 Special Hazards of Combustion Products: Not pertinent</div> <div>6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.</div> <div>6.7 Ignition Temperature: 670°F</div> <div>6.8 Electrical Hazard: Class I, Group D</div> <div>6.9 Burning Rate: 5.5 mm/min.</div> <div>6.10 Adiabatic Flame Temperature: Data not available</div> <div>6.11 Stoichiometric Air to Fuel Ratio: Data not available</div> <div>6.12 Flame Temperature: Data not available</div>	<div>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U</div>																																				
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Reactivity																																					
Other Chemicals	1																																				
Water	0																																				
Self Reaction	0																																				
Category	Classification																																				
Health Hazard (Blue)	2																																				
Flammability (Red)	3																																				
Reactivity (Yellow)	0																																				
<div>8. WATER POLLUTION</div> <div>8.1 Aquatic Toxicity: 22 ppm/96 hr/bluegill/TL<sub>50</sub>/fresh water</div> <div>8.2 Waterfowl Toxicity: Data not available</div> <div>8.3 Biological Oxygen Demand (BOD): 0 lb/lb in 5 days</div> <div>8.4 Food Chain Concentration Potential: Data not available</div>	<div>12. PHYSICAL AND CHEMICAL PROPERTIES</div> <div>12.1 Physical State at 15°C and 1 atm: Liquid</div> <div>12.2 Molecular Weight: 106.16</div> <div>12.3 Boiling Point at 1 atm: 200.9°F = 133.3°C = 411.5°K</div> <div>12.4 Freezing Point: 56.9°F = 13.3°C = 286.5°K</div> <div>12.5 Critical Temperature: 548.4°F = 343.0°C = 616.2°K</div> <div>12.6 Critical Pressure: 608.4 atm = 64.65 psi = 3.510 MPa</div> <div>12.7 Specific Gravity: 0.861 at 20°C (liquid)</div> <div>12.8 Liquid Surface Tension: 28.3 dynes/cm = 0.0283 N/m at 20°C</div> <div>12.9 Liquid Water Interfacial Tension: 37.8 dynes/cm = 0.0378 N/m at 20°C</div> <div>12.10 Vapor (Gas) Specific Gravity: Not pertinent</div> <div>12.11 Ratio of Specific Heats of Vapor (Gas): 1.071</div> <div>12.12 Latent Heat of Vaporization: 150 Btu/lb = 61 cal/g = 3.4 X 10<sup>4</sup> J/kg</div> <div>12.13 Heat of Combustion: -17,558 Btu/lb = -8764.7 cal/g = -408.41 X 10<sup>4</sup> J/kg</div> <div>12.14 Heat of Decomposition: Not pertinent</div> <div>12.15 Heat of Solution: Not pertinent</div> <div>12.16 Heat of Polymerization: Not pertinent</div> <div>12.17 Heat of Fusion: 37.85 cal/g</div> <div>12.18 Limiting Values: Data not available</div> <div>12.19 Reid Vapor Pressure: 0.34 psi</div>																																				
<div>9. SHIPPING INFORMATION</div> <div>9.1 Grades of Purity: Research: 99.99%; Pure: 99.9%; Technical: 99.0%</div> <div>9.2 Storage Temperature: Ambient</div> <div>9.3 Inert Atmosphere: No requirement</div> <div>9.4 Venting: Open (flame arrester) or pressure-vacuum</div>																																					

NOTES

**APPENDIX C**  
**SAMPLING PROCEDURES**

# **COMPENDIUM OF ERT SOIL SAMPLING AND SURFACE GEOPHYSICS PROCEDURES**

**Sampling Equipment Decontamination**

**Soil Sampling**

**Soil Gas Sampling**

**General Surface Geophysics**

**Interim Final**

**Environmental Response Team  
Emergency Response Division**

**Office of Emergency and Remedial Response  
U.S. Environmental Protection Agency  
Washington, DC 20460**

## 1.0 SAMPLING EQUIPMENT DECONTAMINATION: SOP #2006

### 1.1 SCOPE AND APPLICATION

This Standard Operating Procedure (SOP) describes methods used for preventing or reducing cross-contamination, and provides general guidelines for sampling equipment decontamination procedures at a hazardous waste site. Preventing or minimizing cross-contamination in sampled media and in samples is important for preventing the introduction of error into sampling results and for protecting the health and safety of site personnel.

Removing or neutralizing contaminants that have accumulated on sampling equipment ensures protection of personnel from permeating substances, reduces or eliminates transfer of contaminants to clean areas, prevents the mixing of incompatible substances, and minimizes the likelihood of sample cross-contamination.

### 1.2 METHOD SUMMARY

Contaminants can be physically removed from equipment, or deactivated by sterilization or disinfection. Gross contamination of equipment requires physical decontamination, including abrasive and non-abrasive methods. These include the use of brushes, air and wet blasting, and high-pressure water cleaning, followed by a wash/rinse process using appropriate cleaning solutions. Use of a solvent rinse is required when organic contamination is present.

### 1.3 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

This section is not applicable to this SOP.

### 1.4 INTERFERENCES AND POTENTIAL PROBLEMS

- The use of distilled/deionized water commonly available from commercial vendors may be acceptable for decontamination of sampling equipment

provided that it has been verified by laboratory analysis to be analyte free.

- An untreated potable water supply is not an acceptable substitute for tap water. Tap water may be used from any municipal water treatment system for mixing of decontamination solutions.
- Acids and solvents utilized in the decontamination sequence pose the health and safety risks of inhalation or skin contact, and raise shipping concerns of permeation or degradation.
- The site work plan must address disposal of the spent decontamination solutions.
- Several procedures can be established to minimize contact with waste and the potential for contamination. For example:
  - Stress work practices that minimize contact with hazardous substances.
  - Use remote sampling, handling, and container-opening techniques when appropriate.
  - Cover monitoring and sampling equipment with protective material to minimize contamination.
  - Use disposable outer garments and disposable sampling equipment when appropriate.

### 1.5 EQUIPMENT/APPARATUS

- appropriate personal protective clothing
- non-phosphate detergent
- selected solvents
- long-handled brushes
- drop cloths/plastic sheeting
- trash container
- paper towels
- galvanized tubs or buckets
- tap water

- distilled/deionized water
- metal/plastic containers for storage and disposal of contaminated wash solutions
- pressurized sprayers for tap and deionized/distilled water
- sprayers for solvents
- trash bags
- aluminum foil
- safety glasses or splash shield
- emergency eyewash bottle

## 1.6 REAGENTS

There are no reagents used in this procedure aside from the actual decontamination solutions and solvents. In general, the following solvents are utilized for decontamination purposes:

- 10% nitric acid<sup>(1)</sup>
- acetone (pesticide grade)<sup>(2)</sup>
- hexane (pesticide grade)<sup>(2)</sup>
- methanol

<sup>(1)</sup> Only if sample is to be analyzed for trace metals.

<sup>(2)</sup> Only if sample is to be analyzed for organics.

## 1.7 PROCEDURES

As part of the health and safety plan, develop and set up a decontamination plan before any personnel or equipment enter the areas of potential exposure. The equipment decontamination plan should include:

- the number, location, and layout of decontamination stations
- which decontamination apparatus is needed
- the appropriate decontamination methods
- methods for disposal of contaminated clothing, apparatus, and solutions

### 1.7.1 Decontamination Methods

All personnel, samples, and equipment leaving the contaminated area of a site must be decontaminated. Various decontamination methods will either physically remove contaminants, inactivate contaminants by disinfection or sterilization, or do both.

In many cases, gross contamination can be removed by physical means. The physical decontamination techniques appropriate for equipment decontamination can be grouped into two categories: abrasive methods and non-abrasive methods.

### Abrasive Cleaning Methods

Abrasive cleaning methods work by rubbing and wearing away the top layer of the surface containing the contaminant. The following abrasive methods are available:

- **Mechanical:** Mechanical cleaning methods use brushes of metal or nylon. The amount and type of contaminants removed will vary with the hardness of bristles, length of brushing time, and degree of brush contact.
- **Air Blasting:** Air blasting is used for cleaning large equipment, such as bulldozers, drilling rigs or augers. The equipment used in air blast cleaning employs compressed air to force abrasive material through a nozzle at high velocities. The distance between the nozzle and the surface cleaned, as well as the pressure of air, the time of application, and the angle at which the abrasive strikes the surface, determines cleaning efficiency. Air blasting has several disadvantages: it is unable to control the amount of material removed, it can aerate contaminants, and it generates large amounts of waste.
- **Wet Blasting:** Wet blast cleaning, also used to clean large equipment, involves use of a suspended fine abrasive delivered by compressed air to the contaminated area. The amount of materials removed can be carefully controlled by using very fine abrasives. This method generates a large amount of waste.

### Non-Abrasive Cleaning Methods

Non-abrasive cleaning methods work by forcing the contaminant off of a surface with pressure. In general, less of the equipment surface is removed using non-abrasive methods. The following non-abrasive methods are available:

- **High-Pressure Water:** This method consists of a high-pressure pump, an operator-controlled directional nozzle, and a high pressure hose. Operating pressure usually ranges from 340 to 680 atmospheres (atm) which relates to flow rates of 20 to 140 liters per minute.
- **Ultra-High-Pressure Water:** This system produces a pressurized water jet (from 1,000 to 4,000 atm). The ultra-high-pressure spray removes tightly-adhered surface film. The water velocity ranges from 500 m/sec (1,000 atm) to 900 m/sec (4,000 atm). Additives can enhance the method. This method is not applicable for hand-held sampling equipment.

### Disinfection/Rinse Methods

- **Disinfection:** Disinfectants are a practical means of inactivating infectious agents.
- **Sterilization:** Standard sterilization methods involve heating the equipment. Sterilization is impractical for large equipment.
- **Rinsing:** Rinsing removes contaminants through dilution, physical attraction, and solubilization.

### 1.7.2 Field Sampling Equipment Cleaning Procedures

Solvent rinses are not necessarily required when organics are not a contaminant of concern and may be eliminated from the sequence specified below. Similarly, an acid rinse is not required if analysis does not include inorganics.

1. Where applicable, follow physical removal procedures specified in section 1.7.1.
2. Wash equipment with a non-phosphate detergent solution.
3. Rinse with tap water.
4. Rinse with distilled/deionized water.
5. Rinse with 10% nitric acid if the sample will be analyzed for trace organics.

6. Rinse with distilled/deionized water.

7. Use a solvent rinse (pesticide grade) if the sample will be analyzed for organics.

8. Air dry the equipment completely.

9. Rinse again with distilled/deionized water.

Selection of the solvent for use in the decontamination process is based on the contaminants present at the site. Use of a solvent is required when organic contamination is present on-site. Typical solvents used for removal of organic contaminants include acetone, benzene, or water. An acid rinse step is required if metals are present on-site. If a particular contaminant fraction is not present at the site, the nine-step decontamination procedure listed above may be modified for site specificity. The decontamination solvent used should not be among the contaminants of concern at the site.

Table 1 lists solvent rinses which may be required for elimination of particular chemicals. After each solvent rinse, the equipment should be air dried and rinsed with distilled/deionized water.

Sampling equipment that requires the use of plastic tubing should be disassembled and the tubing replaced with clean tubing, before commencement of sampling and between sampling locations.

### 1.8 CALCULATIONS

This section is not applicable to this SOP.

### 1.9 QUALITY ASSURANCE/QUALITY CONTROL

One type of quality control sample specific to the field decontamination process is the rinsate blank. The rinsate blank provides information on the effectiveness of the decontamination process employed in the field. When used in conjunction with field blanks and trip blanks, a rinsate blank can detect contamination during sample handling, storage and sample transportation to the laboratory.

Table 1: Recommended Solvent Rinse for Soluble Contaminants

SOLVENT	SOLUBLE CONTAMINANTS
Water	<ul style="list-style-type: none"> <li>• Low-chain hydrocarbons</li> <li>• Inorganic compounds</li> <li>• Salts</li> <li>• Some organic acids and other polar compounds</li> </ul>
Dilute Acids	<ul style="list-style-type: none"> <li>• Basic (caustic) compounds</li> <li>• Amines</li> <li>• Hydrazines</li> </ul>
Dilute Bases – for example, detergent and soap	<ul style="list-style-type: none"> <li>• Metals</li> <li>• Acidic compounds</li> <li>• Phenol</li> <li>• Thiols</li> <li>• Some nitro and sulfonic compounds</li> </ul>
Organic Solvents <sup>(1)</sup> - for example, alcohols, ethers, ketones, aromatics, straight-chain alkanes (e.g., hexane), and common petroleum products (e.g., fuel, oil, kerosene)	<ul style="list-style-type: none"> <li>• Nonpolar compounds (e.g., some organic compounds)</li> </ul>

<sup>(1)</sup> - WARNING: Some organic solvents can permeate and/or degrade protective clothing.

A rinse blank consists of a sample of analytic-free (i.e., deionized) water which is passed over and through a field decontaminated sampling device and placed in a clean sample container.

Rinse blanks should be run for all parameters of interest at a rate of 1 per 20 for each parameter, even if samples are not shipped that day. Rinse blanks are not required if dedicated sampling equipment is used.

## 1.10 DATA VALIDATION

This section is not applicable to this SOP.

## 1.11 HEALTH AND SAFETY

When working with potentially hazardous materials, follow U.S. EPA, OSHA and specific health and safety procedures.

Decontamination can pose hazards under certain circumstances even though performed to protect

health and safety. Hazardous substances may be incompatible with decontamination methods. For example, the decontamination solution or solvent may react with contaminants to produce heat, explosion, or toxic products. Decontamination methods may be incompatible with clothing or equipment: some solvents can permeate or degrade protective clothing. Also, decontamination solutions and solvents may pose a direct health hazard to workers through inhalation or skin contact, or if they combust.

The decontamination solutions and solvents must be determined to be compatible before use. Any method that permeates, degrades, or damages personal protective equipment should not be used. If decontamination methods pose a direct health hazard, measures should be taken to protect personnel or the methods should be modified to eliminate the hazard.

## 2.0 SOIL SAMPLING: SOP #2012

### 2.1 SCOPE AND APPLICATION

The purpose of this Standard Operating Procedure (SOP) is to describe the procedures for collecting representative soil samples. Analysis of soil samples may determine whether concentrations of specific soil pollutants exceed established action levels, or if the concentrations of soil pollutants present a risk to public health, welfare, or the environment.

### 2.2 METHOD SUMMARY

Soil samples may be collected using a variety of methods and equipment. The methods and equipment used are dependent on the depth of the desired sample, the type of sample required (disturbed versus undisturbed), and the type of soil. Near-surface soils may be easily sampled using a spade, trowel, and scoop. Sampling at greater depths may be performed using a hand auger, a trier, a split-spoon, or, if required, a backhoe.

### 2.3 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

Chemical preservation of solids is not generally recommended. Refrigeration to 4°C, supplemented by a minimal holding time, is usually the best approach.

### 2.4 INTERFERENCES AND POTENTIAL PROBLEMS

There are two primary interferences or potential problems associated with soil sampling. These include cross-contamination of samples and improper sample collection. Cross-contamination problems can be eliminated or minimized through the use of dedicated sampling equipment. If this is not possible or practical, then decontamination of sampling equipment is necessary. Improper sample collection can involve using contaminated equipment, disturbance of the matrix resulting in compaction of the sample, or inadequate homogenization of the samples where required,

resulting in variable, non-representative results.

### 2.5 EQUIPMENT/APPARATUS

- sampling plan
- maps/plot plan
- safety equipment, as specified in the health and safety plan
- compass
- tape measure
- survey stakes or flags
- camera and film
- stainless steel, plastic, or other appropriate homogenization bucket or bowl
- 1-quart mason jars w/Teflon liners
- Ziploc plastic bags
- logbook
- labels
- chain of custody forms and seals
- field data sheets
- cooler(s)
- ice
- decontamination supplies/equipment
- canvas or plastic sheet
- spade or shovel
- spatula
- scoop
- plastic or stainless steel spoons
- trowel
- continuous flight (screw) auger
- bucket auger
- post hole auger
- extension rods
- T-handle
- sampling trier
- thin-wall tube sampler
- Vahmeyer soil sampler outfit
  - tubes
  - points
  - drive head
  - drop hammer
  - puller jack and grip
- backhoe

### 2.6 REAGENTS

Reagents are not used for the preservation of soil samples. Decontamination solutions are specified in



## 2.7 PROCEDURES

### 2.7.1 Preparation

1. Determine the extent of the sampling effort, the sampling methods to be employed, and which equipment and supplies are required.
2. Obtain necessary sampling and monitoring equipment.
3. Decontaminate or pre-clean equipment, and ensure that it is in working order.
4. Prepare schedules, and coordinate with staff, client, and regulatory agencies, if appropriate.
5. Perform a general site survey prior to site entry in accordance with the site-specific health and safety plan.
6. Use stakes, buoys, or flagging to identify and mark all sampling locations. Consider specific site factors, including extent and nature of contaminant, when selecting sample location. If required, the proposed locations may be adjusted based on site access, property boundaries, and surface obstructions. All staked locations will be utility-cleared by the property owner prior to soil sampling.

### 2.7.2 Sample Collection

#### *Surface Soil Samples*

Collect samples from near-surface soil with tools such as spades, shovels, and scoops. Surface material can be removed to the required depth with this equipment, then a stainless steel or plastic scoop can be used to collect the sample.

This method can be used in most soil types but is limited to sampling near surface areas. Accurate, representative samples can be collected with this procedure depending on the care and precision demonstrated by the sampling team member. The use of a flat, pointed mason trowel to cut a block of the desired soil can be helpful when undisturbed profiles are required. A stainless steel scoop, lab spoon, or plastic spoon will suffice in most other

applications. Avoid the use of devices plated with chrome or other materials. Plating is particularly common with garden implements such as potting trowels.

Follow these procedures to collect surface soil samples.

1. Carefully remove the top layer of soil or debris to the desired sample depth with a pre-cleaned spade.
2. Using a pre-cleaned, stainless steel scoop, plastic spoon, or trowel, remove and discard a thin layer of soil from the area which came in contact with the spade.
3. If volatile organic analysis is to be performed, transfer a portion of the sample directly into an appropriate, labeled sample container(s) with a stainless steel lab spoon, plastic lab spoon, or equivalent and secure the cap(s) tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogeneous sample representative of the entire sampling interval. Then, either place the sample into an appropriate, labeled container(s) and secure the cap(s) tightly; or, if composite samples are to be collected, place a sample from another sampling interval into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled container(s) and secure the cap(s) tightly.

#### *Sampling at Depth with Augers and Thin-Wall Tube Samplers*

This system consists of an auger, a series of extensions, a T handle, and a thin-wall tube sampler (Appendix A, Figure 1). The auger is used to bore a hole to a desired sampling depth, and is then withdrawn. The sample may be collected directly from the auger. If a core sample is to be collected, the auger tip is then replaced with a thin-wall tube sampler. The system is then lowered down the borehole, and driven into the soil at the completion depth. The system is withdrawn and the core collected from the thin-wall tube sampler.

Several types of augers are available. These include: bucket, continuous flight (screw), and posthole augers. Bucket augers are better for direct

sample recovery since they provide a large volume of sample in a short time. When continuous flight augers are used, the sample can be collected directly from the flights, which are usually at 5-foot intervals. The continuous flight augers are satisfactory for use when a composite of the complete soil column is desired. Posthole augers have limited utility for sample collection as they are designed to cut through fibrous, rooted, swampy soil.

Follow these procedures for collecting soil samples with the auger and a thin-wall tube sampler.

1. Attach the auger bit to a drill rod extension, and attach the "T" handle to the drill rod.
2. Clear the area to be sampled of any surface debris (e.g., twigs, rocks, litter). It may be advisable to remove the first 3 to 6 inches of surface soil for an area approximately 6 inches in radius around the drilling location.
3. Begin augering, periodically removing and depositing accumulated soils onto a plastic sheet spread near the hole. This prevents accidental brushing of loose material back down the borehole when removing the auger or adding drill rods. It also facilitates refilling the hole, and avoids possible contamination of the surrounding area.
4. After reaching the desired depth, slowly and carefully remove the auger from boring. When sampling directly from the auger, collect sample after the auger is removed from boring and proceed to Step 10.
5. Remove auger tip from drill rods and replace with a pre-cleaned thin-wall tube sampler. Install proper cutting tip.
6. Carefully lower the tube sampler down the borehole. Gradually force the tube sampler into the soil. Care should be taken to avoid scraping the borehole sides. Avoid hammering the drill rods to facilitate coring as the vibrations may cause the boring walls to collapse.
7. Remove the tube sampler, and unscrew the drill rods.
8. Remove the cutting tip and the core from the device.

9. Discard the top of the core (approximately 1 inch), as this represents material collected before penetration of the layer of concern. Place the remaining core into the appropriate labeled sample container(s). Sample homogenization is not required.
10. If volatile organic analysis is to be performed, transfer a portion of the sample directly into an appropriate, labeled sample container(s) with a stainless steel lab spoon, plastic lab spoon, or equivalent and secure the cap(s) tightly. Place the remainder of the sample into a stainless-steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogeneous sample representative of the entire sampling interval. Then, either place the sample into an appropriate labeled container(s) and secure the cap(s) tightly, or, if composite samples are to be collected, place a sample from another sampling interval into the homogenization container and mix thoroughly. When compositing is complete, place the sample into the appropriate labeled container(s) and secure the cap(s) tightly.
11. If another sample is to be collected in the same hole, but at a greater depth, reattach the auger bit to the drill and assembly, and follow steps 3 through 11, making sure to decontaminate the auger and tube sampler between samples.
12. Abandon the hole according to applicable state regulations. Generally, shallow holes can simply be backfilled with the removed soil material.

### **Sampling at Depth with a Trier**

The system consists of a trier, and a "T" handle. The auger is driven into the soil to be sampled and used to extract a core sample from the appropriate depth.

Follow these procedures to collect soil samples with a sampling trier.

1. Insert the trier (Appendix A, Figure 2) into the material to be sampled at a 0° to 45° angle from horizontal. This orientation minimizes the spillage of sample.
2. Rotate the trier once or twice to cut a core of material.

# **COMPENDIUM OF ERT SURFACE WATER AND SEDIMENT SAMPLING PROCEDURES**

**Sampling Equipment Decontamination**

**Surface Water Sampling**

**Sediment Sampling**

**Interim Final**

**Environmental Response Team  
Emergency Response Division**

**Office of Emergency and Remedial Response  
U.S. Environmental Protection Agency  
Washington, DC 20460**

**REPRODUCED BY  
U.S. DEPARTMENT OF COMMERCE  
NATIONAL TECHNICAL  
INFORMATION SERVICE**

## 2.0 SURFACE WATER SAMPLING: SOP #2013

### 2.1 SCOPE AND APPLICATION

This Standard Operating Procedure (SOP) is applicable to the collection of representative liquid samples, both aqueous and nonaqueous from streams, rivers, lakes, ponds, lagoons, and surface impoundments. It includes samples collected from depth, as well as samples collected from the surface.

### 2.2 METHOD SUMMARY

Sampling situations vary widely and therefore no universal sampling procedure can be recommended.

However, sampling of both aqueous and non-aqueous liquids from the above mentioned sources is generally accomplished through the use of one of the following samplers or techniques:

- Kemmerer bottle
- bacon bomb sampler
- dip sampler
- direct method

These sampling techniques will allow for the collection of representative samples from the majority of surface waters and impoundments encountered.

### 2.3 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

Once samples have been collected, follow these procedures:

1. Transfer the sample(s) into suitable labeled sample containers.
2. Preserve the sample if appropriate, or use pre-preserved sample bottles.
3. Cap the container, put it in a Ziploc plastic bag and place it on ice in a cooler.
4. Record all pertinent data in the site logbook and on a field data sheet.

5. Complete the chain of custody form.

6. Attach custody seals to the cooler prior to shipment.

7. Decontaminate all sampling equipment prior to the collection of additional samples.

### 2.4 INTERFERENCES AND POTENTIAL PROBLEMS

There are two primary interferences or potential problems with surface water sampling. These include cross-contamination of samples and improper sample collection.

- Cross-contamination problems can be eliminated or minimized through the use of dedicated sampling equipment. If this is not possible or practical, then decontamination of sampling equipment is necessary. Refer to ERT SOP #2006, Sampling Equipment Decontamination.
- Improper sample collection can involve using contaminated equipment, disturbance of the stream or impoundment substrate, and sampling in an obviously disturbed area.

Following proper decontamination procedures and minimizing disturbance of the sample site will eliminate these problems.

### 2.5 EQUIPMENT/APPARATUS

Equipment needed for collection of surface water samples includes:

- Kemmerer bottles
- bacon bomb sampler
- dip sampler
- line and messengers
- sample bottle preservatives
- Ziploc bags
- ice
- cooler(s)
- chain of custody forms, field data sheets

1. Using a properly decontaminated Kemmerer bottle, set the sampling device so that the sampling end pieces are pulled away from the sampling tube, allowing the substance to be sampled to pass through this tube.
2. Lower the pre-set sampling device to the predetermined depth. Avoid bottom disturbance.
3. When the Kemmerer bottle is at the required depth, send down the messenger, closing the sampling device.
4. Retrieve the sampler and discharge the first 10 to 20 mL to clear any potential contamination on the valve. Transfer the sample to the appropriate sample container.

### **Bacon Bomb Sampler**

A bacon bomb sampler (Figure 2, Appendix A) may be used in similar situations to those outlined for the Kemmerer bottle. Sampling procedures are as follows:

1. Lower the bacon bomb sampler carefully to the desired depth, allowing the line for the trigger to remain slack at all times. When the desired depth is reached, pull the trigger line until taut.
2. Release the trigger line and retrieve the sampler.
3. Transfer the sample to the appropriate sample container by pulling the trigger.

### **Dip Sampler**

A dip sampler (Figure 3, Appendix A) is useful for situations where a sample is to be recovered from an outfall pipe or along a lagoon bank where direct access is limited. The long handle on such a device allows access from a discrete location. Sampling procedures are as follows:

1. Assemble the device in accordance with the manufacturer's instructions.
2. Extend the device to the sample location and collect the sample.
3. Retrieve the sampler and transfer the sample to the appropriate sample container.

### **Direct Method**

For streams, rivers, lakes, and other surface waters, the direct method may be utilized to collect water samples from the surface. This method is not to be used for sampling lagoons or other impoundments where contact with contaminants are a concern.

Using adequate protective clothing, access the sampling station by appropriate means. For shallow stream stations, collect the sample under the water surface pointing the sample container upstream. The container must be upstream of the collector. Avoid disturbing the substrate. For lakes and other impoundments, collect the sample under the water surface avoiding surface debris and the boat wake.

When using the direct method, do not use pre-preserved sample bottles as the collection method may dilute the concentration of preservative necessary for proper sample preservation.

## **2.8 CALCULATIONS**

This section is not applicable to this SOP.

## **2.9 QUALITY ASSURANCE/QUALITY CONTROL**

There are no specific quality assurance activities which apply to the implementation of these procedures. However, the following general QA/QC procedures apply:

- All data must be documented on field data sheets or within site logbooks.
- All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment checkout and calibration activities must occur prior to sampling/operation and they must be documented.

## **2.10 DATA VALIDATION**

This section is not applicable to this SOP.

## 3.0 SEDIMENT SAMPLING: SOP #2016

### 3.1 SCOPE AND APPLICATION

This Standard Operating Procedure (SOP) is applicable to the collection of representative sediment samples. Analysis of sediment may determine whether concentrations of specific contaminants exceed established threshold action levels, or if the concentrations present a risk to public health, welfare, or the environment.

The methodologies discussed in this procedure are applicable to the sampling of sediment in both flowing and standing water. They are generic in nature and may be modified in whole or part to meet the handling and analytical requirements of the contaminants of concern, as well as the constraints presented by the sampling area. However, if modifications occur, they should be documented in the site logbook or report summarizing field activities.

For the purposes of this procedure, sediments are those mineral and organic materials situated beneath an aqueous layer. The aqueous layer may be either static, as in lakes, ponds, or other impoundments or flowing, as in rivers and streams.

### 3.2 METHOD SUMMARY

Sediment samples may be recovered using a variety of methods and equipment, depending on the depth of the aqueous layer, the portion of the sediment profile required (surface versus subsurface), the type of sample required (disturbed versus undisturbed) and the sediment type.

Sediment is collected from beneath an aqueous layer either directly, using a hand-held device such as a shovel, trowel, or auger, or indirectly using a remotely activated device such as an Ekman or Ponar dredge. Following collection, the sediment is placed into a container constructed of inert material, homogenized, and transferred to the appropriate sample containers. The homogenization procedure should not be used if sample analysis includes volatile organics.

### 3.3 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

- Chemical preservation of solids is generally not recommended. Cooling is usually the best approach, supplemented by the appropriate holding time.
- Wide-mouth glass containers with Teflon-lined caps are utilized for sediment samples. The sample volume is a function of the analytical requirements and will be specified in the work plan.
- Transfer sediment from the sample collection device to an appropriate sample container using a stainless steel or plastic lab spoon or equivalent. If composite samples are collected, place the sediment sample in a stainless steel, plastic or other appropriate composition (e.g., Teflon) bucket, and mix thoroughly to obtain a homogeneous sample representative of the entire sampling interval. Then place the sediment sample into labeled containers.
- Samples for volatile organic analysis must be collected directly from the bucket, before mixing the sample, to minimize loss due to volatilization of contaminants.
- All sampling devices should be decontaminated, then wrapped in aluminum foil. The sampler should remain in this wrapping until it is needed. Each sampler should be used for only one sample. Dedicated samplers for sediment samples may be impractical due to the large number of sediment samples which may be required and the cost of the sampler. In this case, samplers should be cleaned in the field using the decontamination procedure described in ERT SOP# 2006, Sampling Equipment Decontamination.

tools such as spades, shovels, and scoops. Surface material can be removed to the required depth; then a stainless steel or plastic scoop should be used to collect the sample.

This method can be used to collect consolidated sediments but is limited somewhat by the depth of the aqueous layer. Accurate, representative samples can be collected with this procedure depending on the care and precision demonstrated by the sample team member. A stainless steel or plastic scoop or lab spoon will suffice in most applications. Care should be exercised to avoid the use of devices plated with chrome or other materials. Plating is particularly common with garden trowels.

Follow these procedures to collect sediment samples with a scoop or trowel:

1. Using a precleaned stainless steel scoop or trowel, remove the desired thickness of sediment from the sampling area.
2. Transfer the sample into an appropriate sample or homogenization container.

### ***Sampling Surface Sediments with a Thin-Wall Tube Auger From Beneath a Shallow Aqueous Layer***

This system consists of an auger, a series of extension rods, and a "T" handle (see Figure 4, Appendix A). The auger is driven into the sediment and used to extract a core. A sample of the core is taken from the appropriate depth.

Use the following procedure to collect sediment samples with a thin-walled auger:

1. Insert the auger into the material to be sampled at a 0° to 45° angle from vertical. This orientation minimizes spillage of the sample from the sampler. Extraction of samples may require tilting of the sampler.
2. Rotate the auger once or twice to cut a core of material.
3. Slowly withdraw the auger, making sure that the slot is facing upward.
4. An acetate core may be inserted into the auger prior to sampling, if characteristics of the sediments or body of water warrant. By using

this technique, an intact core can be extracted.

5. Transfer the sample into an appropriate sample or homogenization container.

### ***Sampling Deep Sediments with Augers and Thin-Wall Tube Samplers From Beneath a Shallow Aqueous Layer***

This system uses an auger, a series of extension rods, a "T" handle, and a thin-wall tube sampler (Figure 4, Appendix A). The auger borers a hole to a desired sampling depth and then is withdrawn. The auger tip is then replaced with a tube core sampler, lowered down the borehole, and driven into the sediment at the completion depth. The core is then withdrawn and the sample collected. This method can be used to collect consolidated sediments, but is somewhat limited by the depth of the aqueous layer.

Several augers are available which include bucket and posthole augers. Bucket augers are better for direct sample recovery, are fast, and provide a large volume of sample. Posthole augers have limited utility for sample collection as they are designed more for their ability to cut through fibrous, rooted, swampy areas.

Follow these procedures to collect sediment samples with a hand auger:

1. Attach the auger bit to a drill extension rod, then attach the "T" handle to the drill extension rod.
2. Clear the area to be sampled of any surface debris.
3. Begin augering, periodically removing any accumulated sediment from the auger bucket.
4. After reaching the desired depth, slowly and carefully remove the auger from boring. (When sampling directly from the auger, collect sample after the auger is removed from boring and proceed to Step 10.)
5. Remove auger tip from drill rods and replace with a precleaned thin-wall tube sampler. Install proper cutting tip.
6. Carefully lower tube sampler down borehole. Gradually force tube sampler into sediment.

subsurface sediments. It consists of a coring device, handle, and acetate core utilized in the following procedure:

1. Assemble the coring device by inserting the acetate core into the sampling tube.
2. Insert the "eggshell" check valve mechanisms into the tip of the sampling tube with the convex surface positioned inside the acetate core.
3. Screw the coring point onto the tip of the sampling tube.
4. Screw the handle onto the upper end of the sampling tube and add extension rods as needed.
5. Place the sampler in a perpendicular position on the material to be sampled.
6. This sampler may be used with either a drive hammer for firm consolidated sediments, or a "T" handle for soft sediments. If the "T" handle is used, place downward pressure on the device until the desired depth is reached. Rotate the sampler to shear off the core of the bottom, retrieve the device and proceed to Step 15.
7. If the drive hammer is selected, insert the tapered handle (drive head) of the drive hammer through the drive head.
8. With left hand holding the tube, drive the sampler into the material to the desired depth. Do not drive the tube further than the tip of the hammer's guide.
9. Record the length of the tube that penetrated the sample material, and the number of blows required to obtain this depth.
10. Remove the drive hammer and fit the keyhole-like opening on the flat side of the hammer onto the drive head. In this position, the hammer serves as a handle for the sampler.
11. Rotate the sampler at least two revolutions to shear off the sample at the bottom.
12. Lower the sampler handle (hammer) until it just clears the two ear-like protrusions on the drive head, and rotate about 90°.

13. Withdraw the sampler by pulling the handle (hammer) upwards and dislodging the hammer from the sampler.

14. Unscrew the coring point and remove the "eggshell" check valve.

15. Slide the acetate core out of the sampler tube. The acetate core may be capped at both ends. The sample may be used in this fashion, or the contents transferred to a stainless steel or plastic bucket and mixed thoroughly to obtain a homogeneous sample representative of the entire sampling interval.

16. Samples for volatile organic analysis must be collected directly from the bucket before mixing the sample to minimize volatilization of contaminants.

### 3.8 CALCULATIONS

This section is not applicable to this SOP.

### 3.9 QUALITY ASSURANCE/ QUALITY CONTROL

There are no specific quality assurance activities which apply to the implementation of these procedures. However, the following QA/QC procedures apply:

1. All data must be documented on field data sheets or within site logbooks.
2. All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment checkout and calibration activities must occur prior to sampling/operation, and they must be documented.

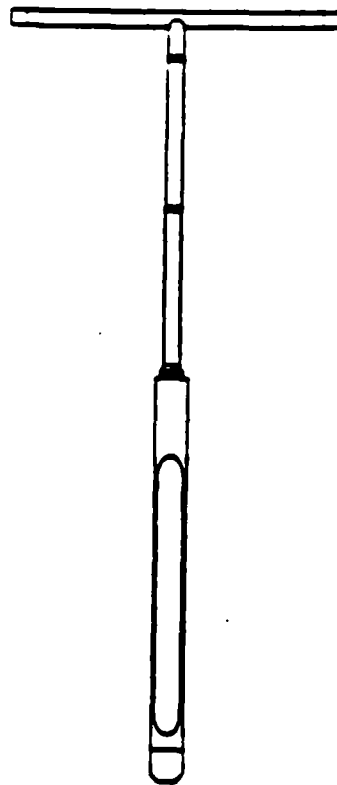
### 3.10 DATA VALIDATION

This section is not applicable to this SOP.

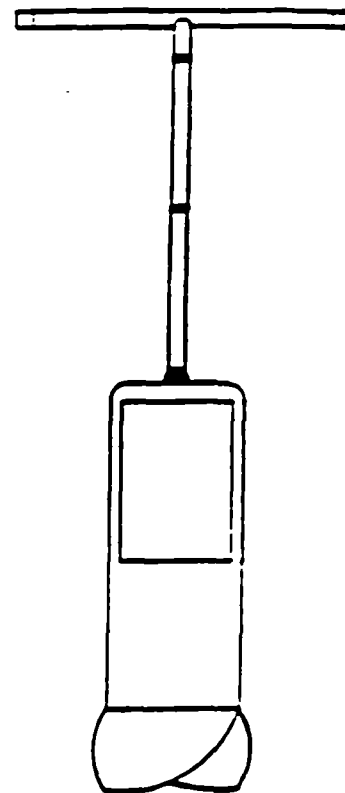


Figure 4: Sampling Auger

SOP #2016



TUBE  
AUGER



BUCKET  
AUGER

# **COMPENDIUM OF ERT GROUNDWATER SAMPLING PROCEDURES**

**Sampling Equipment Decontamination**

**Groundwater Well Sampling**

**Soil Gas Sampling**

**Monitoring Well Installation**

**Water Level Measurement**

**Well Development**

**Controlled Pumping Test**

**Slug Test**

**Interim Final**

**Environmental Response Team  
Emergency Response Division**

**Office of Emergency and Remedial Response  
U.S. Environmental Protection Agency  
Washington, DC 20460**



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## 2.0 GROUNDWATER WELL SAMPLING: SOP #2007

### 2.1 SCOPE AND APPLICATION

The objective of this Standard Operating Procedure (SOP) is to provide general reference information on sampling of groundwater wells. This guideline is primarily concerned with the collection of water samples from the saturated zone of the subsurface. Every effort must be made to ensure that the sample is representative of the particular zone of water being sampled. These procedures are designed to be used in conjunction with analyses for the most common types of groundwater contaminants (e.g., volatile and semi-volatile organic compounds, pesticides, metals, biological parameters).

### 2.2 METHOD SUMMARY

Prior to sampling a monitoring well, the well must be purged. This may be done with a number of instruments. The most common of these are the bailer, submersible pump, non-gas contact bladder pump and inertia pump. At a minimum, three well volumes should be purged, if possible. Equipment must be decontaminated prior to use and between wells. Once purging is completed and the correct laboratory-cleaned sample containers have been prepared, sampling may proceed. Sampling may be conducted with any of the above instruments, and need not be the same as the device used for purging. Care should be taken when choosing the sampling device as some will affect the integrity of the sample. Sampling equipment must also be decontaminated. Sampling should occur in a progression from the least to most contaminated well, if this information is known.

### 2.3 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

The type of analysis for which a sample is being collected determines the type of bottle, preservative, holding time, and filtering requirements. Samples should be collected directly from the sampling device into appropriate laboratory-cleaned containers. Check that a Teflon liner is present in

the cap, if required. Attach a sample identification label. Complete a field data sheet, a chain of custody form and record all pertinent data in the site logbook.

Samples shall be appropriately preserved, labelled, logged, and placed in a cooler to be maintained at 4°C. Samples must be shipped well before the holding time is over and ideally should be shipped within 24 hours of sample collection. It is imperative that these samples be shipped or delivered daily to the analytical laboratory in order to maximize the time available for the laboratory to perform the analysis. The bottles should be shipped with adequate packing and cooling to ensure that they arrive intact.

Certain conditions may require special handling techniques. For example, treatment of a sample for volatile organic (VOA) analysis with sodium thiosulfate preservative is required if there is residual chlorine in the water (such as public water supply) that could cause free radical chlorination and change the identity of the original contaminants. However, sodium thiosulfate should not be used if chlorine is not present in the water. Special requirements must be determined prior to conducting fieldwork.

### 2.4 INTERFERENCES AND POTENTIAL PROBLEMS

#### 2.4.1 General

The primary goal of groundwater sampling is to obtain a representative sample of the groundwater body. Analysis can be compromised by field personnel in two primary ways: (1) taking an unrepresentative sample, or (2) by incorrect handling of the sample. There are numerous ways of introducing foreign contaminants into a sample, and these must be avoided by following strict sampling procedures and only utilizing trained field personnel.

#### 2.4.2 Purging

In a non-pumping well, there will be little or no vertical mixing of the water, and stratification will

occur. The well water in the screened section will mix with the groundwater due to normal flow patterns, but the well water above the screened section will remain isolated, become stagnant and lack the VOAs representative of the groundwater. Sampling personnel should realize that stagnant water may contain foreign material inadvertently or deliberately introduced from the surface, resulting in an unrepresentative sample. To safeguard against collecting nonrepresentative stagnant water, follow these guidelines during sampling:

- As a general rule, all monitoring wells should be pumped or bailed prior to sampling. Purge water should be containerized on site or handled as specified in the site-specific project plan. Evacuation of a minimum of one volume of water in the well casing, and preferably three to five volumes, is recommended for a representative sample. In a high-yielding ground water formation and where there is no stagnant water in the well above the screened section, evacuation prior to sample withdrawal is not as critical. However, in all cases where the monitoring data is to be used for enforcement actions, evacuation is recommended.
- For wells that can be pumped or bailed to dryness with the equipment being used, the well should be evacuated and allowed to recover prior to sample withdrawal. If the recovery rate is fairly rapid and the schedule allows, evacuation of more than one volume of water is preferred. If recovery is slow, sample the well upon recovery after one evacuation.
- A nonrepresentative sample can also result from excessive pre-pumping of the monitoring well. Stratification of the leachate concentration in the groundwater formation may occur, or heavier-than-water compounds may sink to the lower portions of the aquifer. Excessive pumping can dilute or increase the contaminant concentrations from what is representative of the sampling point of interest.

#### 2.4.3 Materials

Samplers and evacuation equipment (bladders, pumps, bailers, tubing, etc.) should be limited to

those made with stainless steel, Teflon, and glass in areas where concentrations are expected to be at or near the detection limit. The tendency of organics to leach into and out of many materials make the selection of materials critical for trace analyses. The use of plastics, such as PVC or polyethylene, should be avoided when analyzing for organics. However, PVC may be used for evacuation equipment as it will not come in contact with the sample.

Table 2 on page 7 discusses the advantages and disadvantages of certain equipment.

## 2.5 EQUIPMENT/APPARATUS

### 2.5.1 General

- water level indicator
  - electric sounder
  - steel tape
  - transducer
  - reflection sounder
  - airline
- depth sounder
- appropriate keys for well cap locks
- steel brush
- HNU or OVA (whichever is most appropriate)
- logbook
- calculator
- field data sheets
- chain of custody forms
- forms and seals
- sample containers
- Engineer's rule
- sharp knife (locking blade)
- tool box (to include at least: screwdrivers, pliers, hacksaw, hammer, flashlight, adjustable wrench)
- leather work gloves
- appropriate health and safety gear
- 5-gallon pail
- plastic sheeting
- shipping containers
- packing materials
- bolt cutters
- Ziploc plastic bags
- containers for evacuation of liquids
- decontamination solutions
- tap water
- non-phosphate soap
- several brushes

**Table 2: Advantages and Disadvantages  
of Various Groundwater Sampling Devices**

Device	Advantages	Disadvantages
Bailer	<ul style="list-style-type: none"> <li>• The only practical limitations are size and materials</li> <li>• No power source needed</li> <li>• Portable</li> <li>• Inexpensive; it can be dedicated and hung in a well reducing the chances of cross-contamination</li> <li>• Minimal outgassing of volatile organics while sample is in bailer</li> <li>• Readily available</li> <li>• Removes stagnant water first</li> <li>• Rapid, simple method for removing small volumes of purge water</li> </ul>	<ul style="list-style-type: none"> <li>• Time consuming, especially for large wells</li> <li>• Transfer of sample may cause aeration</li> </ul>
Submersible Pump	<ul style="list-style-type: none"> <li>• Portable; can be used on an unlimited number of wells</li> <li>• Relatively high pumping rate (dependent on depth and size of pump)</li> <li>• Generally very reliable; does not require priming</li> </ul>	<ul style="list-style-type: none"> <li>• Potential for effects on analysis of trace organics</li> <li>• Heavy and cumbersome, particularly in deeper wells</li> <li>• Expensive</li> <li>• Power source needed</li> <li>• Susceptible to damage from silt or sediment</li> <li>• Impractical in low yielding or shallow wells</li> </ul>
Non-Gas Contact Bladder Pump	<ul style="list-style-type: none"> <li>• Maintains integrity of sample</li> <li>• Easy to use</li> </ul>	<ul style="list-style-type: none"> <li>• Difficult to clean although dedicated tubing and bladder may be used</li> <li>• Only useful to approximately 100 feet in depth</li> <li>• Supply of gas for operation (bottled gas and/or compressor) is difficult to obtain and is cumbersome</li> </ul>
Suction Pump	<ul style="list-style-type: none"> <li>• Portable, inexpensive, and readily available</li> </ul>	<ul style="list-style-type: none"> <li>• Only useful to approximately 25 feet or less in depth</li> <li>• Vacuum can cause loss of dissolved gases and volatile organics</li> <li>• Pump must be primed and vacuum is often difficult to maintain</li> <li>• May cause pH modification</li> </ul>
Inertia Pump	<ul style="list-style-type: none"> <li>• Portable, inexpensive, and readily available</li> <li>• Rapid method for purging relatively shallow wells</li> </ul>	<ul style="list-style-type: none"> <li>• Only useful to approximately 70 feet or less in depth</li> <li>• May be time consuming to use</li> <li>• Labor intensive</li> <li>• WaTerra pump is only effective in 2-inch diameter wells</li> </ul>

- pails or tubs
- aluminum foil
- garden sprayer
- preservatives
- distilled or deionized water

### 2.5.2 Bailer

- clean, decontaminated bailer(s) of appropriate size and construction material
- nylon line, enough to dedicate to each well
- Teflon-coated bailer wire
- sharp knife
- aluminum foil (to wrap clean bailers)
- 5-gallon bucket

### 2.5.3 Submersible Pump

- pump(s)
- generator (110, 120, or 240 volt) or 12-volt battery if inaccessible to field vehicle
- 1-inch black PVC coil pipe -- enough to dedicate to each well
- hose clamps
- safety cable
- tool box supplement
  - pipe wrenches, 2
  - wire strippers
  - electrical tape
  - heat shrink
  - hose connectors
  - Teflon tape
- winch or pulley
- gasoline for generator
- flow meter with gate valve
- 1-inch nipples and various plumbing (i.e., pipe connectors)

### 2.5.4 Non-Gas Contact Bladder Pump

- non-gas contact bladder pump
- compressor or nitrogen gas tank
- batteries and charger
- Teflon tubing -- enough to dedicate to each well
- Swagelock fitting
- toolbox supplements -- same as submersible pump

### 2.5.5 Suction Pump

- pump
- black coil tubing -- enough to dedicate to each well

- gasoline -- if required
- toolbox
- plumbing fittings
- flow meter with gate valve

### 2.5.6 Inertia Pump

- pump assembly (WaTerra pump, piston pump)
- 5-gallon bucket

## 2.6 REAGENTS

Reagents will be utilized for preservation of samples and for decontamination of sampling equipment. The preservation required is specified by the analysis to be performed. Decontamination solutions are specified in ERT SOP #2006, Sampling Equipment Decontamination.

## 2.7 PROCEDURES

### 2.7.1 Preparation

1. Determine the extent of the sampling effort, the sampling methods to be employed, and which equipment and supplies are needed.
2. Obtain necessary sampling and monitoring equipment.
3. Decontaminate or preclean equipment, and ensure that it is in working order.
4. Prepare scheduling and coordinate with staff, clients, and regulatory agency, if appropriate.
5. Perform a general site survey prior to site entry in accordance with the site-specific health and safety plan.
6. Identify and mark all sampling locations.

### 2.7.2 Field Preparation

1. Start at the least contaminated well, if known.
2. Lay plastic sheeting around the well to minimize likelihood of contamination of equipment from soil adjacent to the well.

3. Remove locking well cap, note location, time of day, and date in field notebook or an appropriate log form.
4. Remove well casing cap.
5. Screen headspace of well with an appropriate monitoring instrument to determine the presence of volatile organic compounds and record in site logbook.
6. Lower water level measuring device or equivalent (i.e., permanently installed transducers or airline) into well until water surface is encountered.
7. Measure distance from water surface to reference measuring point on well casing or protective barrier post and record in site logbook. Alternatively, if there is no reference point, note that water level measurement is from top of steel casing, top of PVC riser pipe, from ground surface, or some other position on the well head.
8. Measure total depth of well (do this at least twice to confirm measurement) and record in site logbook or on log form.
9. Calculate the volume of water in the well and the volume to be purged using the calculations in Section 2.8.
10. Select the appropriate purging and sampling equipment.

### 2.7.3 Evacuation of Static Water (Purging)

The amount of flushing a well receives prior to sample collection depends on the intent of the monitoring program as well as the hydrogeologic conditions. Programs where overall quality determination of water resources are involved may require long pumping periods to obtain a sample that is representative of a large volume of that aquifer. The pumped volume can be determined prior to sampling so that the sample is a composite of known volume of the aquifer, or the well can be pumped until the stabilization of parameters such as temperature, electrical conductance, or pH has occurred.

However, monitoring for defining a contaminant plume requires a representative sample of a small volume of the aquifer. These circumstances require that the well be pumped enough to remove the stagnant water but not enough to induce flow from other areas. Generally, three well volumes are considered effective, or calculations can be made to determine, on the basis of the aquifer parameters and well dimensions, the appropriate volume to remove prior to sampling.

During purging, water level measurements may be taken regularly at 15- to 30-second intervals. This data may be used to compute aquifer transmissivity and other hydraulic characteristics.

The following well evacuation devices are most commonly used. Other evacuation devices are available, but have been omitted in this discussion due to their limited use.

#### Bailer

Bailers are the simplest purging device used and have many advantages. They generally consist of a rigid length of tube, usually with a ball check valve at the bottom. A line is used to lower the bailer into the well and retrieve a volume of water. The three most common types of bailer are PVC, Teflon, and stainless steel.

This manual method of purging is best suited to shallow or narrow diameter wells. For deep, larger diameter wells which require evacuation of large volumes of water, other mechanical devices may be more appropriate.

Bailing equipment includes a clean decontaminated bailer, Teflon or nylon line, a sharp knife, and plastic sheeting.

1. Determine the volume of water to be purged as described in Section 2.7.2, Field Preparation.
2. Lay plastic sheeting around the well to prevent contamination of the bailer line with foreign materials.
3. Attach the line to the bailer and lower until the bailer is completely submerged.
4. Pull bailer out ensuring that the line either falls onto a clean area of plastic sheeting or never touches the ground.

5. Empty the bailer into a pail until full to determine the number of bails necessary to achieve the required purge volume.
6. Thereafter, pour the water into a container and dispose of purge waters as specified in the site-specific project plan.

### ***Submersible Pump***

Submersible pumps are generally constructed of plastic, rubber, and metal parts which may affect the analysis of samples for certain trace organics and inorganics. As a consequence, submersible pumps may not be appropriate for investigations requiring analyses of samples for trace contaminants. However, they are still useful for pre-sample purging. However, the pump must have a check valve to prevent water in the pump and the pipe from rushing back into the well.

Submersible pumps generally use one of two types of power supplies, either electric or compressed gas. Electric pumps can be powered by a 12-volt DC rechargeable battery, or a 110- or 220-volt AC power supply. Those units powered by compressed gas normally use a small electric compressor which also needs 12-volt DC or 110-volt AC power. They may also utilize compressed gas from bottles. Pumps differ according to the depth and diameter of the monitoring wells.

1. Determine the volume of water to be purged as described in section 2.7.2, Field Preparation.
2. Lay plastic sheeting around the well to prevent contamination of pumps, hoses or lines with foreign materials.
3. Assemble pump, hoses and safety cable, and lower the pump into the well. Make sure the pump is deep enough so that purging does not evacuate all the water. (Running the pump without water may cause damage.)
4. Attach flow meter to the outlet hose to measure the volume of water purged.
5. Attach power supply, and purge well until specified volume of water has been evacuated (or until field parameters, such as temperature, pH, conductivity, etc. have stabilized). Do not allow the pump to run dry. If the pumping rate

exceeds the well recharge rate, lower the pump further into the well, and continue pumping.

6. Collect and dispose of purge waters as specified in the site-specific project plan.

### ***Non-Contact Gas Bladder Pump***

For this procedure, an all stainless-steel and Teflon Middleburg-squeeze bladder pump (e.g., IEA, TIMCO, Well Wizard, Geoguard, and others) is used to provide the least amount of material interference to the sample (Barcelona, 1985). Water comes into contact with the inside of the bladder (Teflon) and the sample tubing, also Teflon, that may be dedicated to each well. Some wells may have permanently installed bladder pumps (i.e., Well Wizard, Geoguard), that will be used to sample for all parameters.

1. Assemble Teflon tubing, pump and charged control box.
2. Use the same procedure for purging with a bladder pump as for a submersible pump.
3. Be sure to adjust flow rate to prevent violent jolting of the hose as sample is drawn in.

### ***Suction Pump***

There are many different types of suction pumps. They include: centrifugal, peristaltic and diaphragm. Diaphragm pumps can be used for well evacuation at a fast pumping rate and sampling at a low pumping rate. The peristaltic pump is a low-volume pump that uses rollers to squeeze the flexible tubing, thereby creating suction. This tubing can be dedicated to a well to prevent cross-contamination. Peristaltic pumps, however, require a power source.

1. Assemble the pump, tubing, and power source if necessary.
2. To purge with a suction pump, follow the exact procedures outlined for the submersible pump.

### ***Inertia Pump***

Inertia pumps, such as the WaTerra pump and piston pump, are manually operated. They are appropriate to use when wells are too deep to bail by hand, but are not inaccessible enough to warrant an automatic (submersible, etc.) pump. These



pumps are made of plastic and may be either decontaminated or discarded, after use.

1. Determine the volume of water to be purged as described in Section 2.7.2, Field Preparation.
2. Lay plastic sheeting around the well to prevent contamination of pumps or hoses with foreign materials.
3. Assemble pump, and lower to the appropriate depth in the well.
4. Begin pumping manually, discharging water into a 5-gallon bucket (or other graduated vessel). Purge until specified volume of water has been evacuated (or until field parameters such as temperature, pH, conductivity, etc. have stabilized).
5. Collect and dispose of purge waters as specified in the site-specific project plan.

## 2.7.4 Sampling

Sample withdrawal methods require the use of pumps, compressed air, bailers, and samplers. Ideally, purging and sample withdrawal equipment should be completely inert, economical to use, easily cleaned, sterilized, reusable, able to operate at remote sites in the absence of power resources, and capable of delivering variable rates for sample collection.

There are several factors to take into consideration when choosing a sampling device. Care should be taken when reviewing the advantages or disadvantages of any one device. It may be appropriate to use a different device to sample than that which was used to purge. The most common example of this is the use of a submersible pump to purge and a bailer to sample.

### Bailer

The positive-displacement volatile sampling bailer (by GPI) is perhaps the most appropriate for collection of water samples for volatile analysis. Other bailer types (messenger, bottom fill, etc.) are less desirable, but may be mandated by cost and site conditions. Generally, bailers can provide an acceptable sample, providing that sampling personnel use extra care in the collection process.

1. Surround the monitoring well with clean plastic sheeting.
2. Attach a line to the bailer. If a bailer was used for purging, the same bailer and line may be used for sampling.
3. Lower the bailer slowly and gently into the well, taking care not to shake the casing sides or to splash the bailer into the water. Stop lowering at a point adjacent to the screen.
4. Allow bailer to fill and then slowly and gently retrieve the bailer from the well, avoiding contact with the casing, so as not to knock flakes of rust or other foreign materials into the bailer.
5. Remove the cap from the sample container and place it on the plastic sheet or in a location where it will not become contaminated. See Section 2.7.7 for special considerations on VOA samples.
6. Begin pouring slowly from the bailer.
7. Filter and preserve samples as required by sampling plan.
8. Cap the sample container tightly and place pre-labeled sample container in a carrier.
9. Replace the well cap.
10. Log all samples in the site logbook and on field data sheets and label all samples.
11. Package samples and complete necessary paperwork.
12. Transport sample to decontamination zone to prepare it for transport to analytical laboratory.

### Submersible Pump

Although it is recommended that samples not be collected with a submersible pump due to the reasons stated in Section 2.4, there are some situations where they may be used.

1. Allow the monitoring well to recharge after purging, keeping the pump just above the screened section.

2. Attach gate valve to hose (if not already fitted), and reduce flow of water to a manageable sampling rate.
3. Assemble the appropriate bottles.
4. If no gate valve is available, run the water down the side of a clean jar and fill the sample bottles from the jar.
5. Cap the sample container tightly and place pre-labeled sample container in a carrier.
6. Replace the well cap.
7. Log all samples in the site logbook and on the field data sheets and label all samples.
8. Package samples and complete necessary paperwork.
9. Transport sample to decontamination zone for preparation for transport to analytical laboratory.
10. Upon completion, remove pump and assembly and fully decontaminate prior to setting into the next sample well. Dedicate the tubing to the hole.
3. Turn pump on, increase the cycle time and reduce the pressure to the minimum that will allow the sample to come to the surface.
4. Cap the sample container tightly and place pre-labeled sample container in a carrier.
5. Replace the well cap.
6. Log all samples in the site logbook and on field data sheets and label all samples.
7. Package samples and complete necessary paperwork.
8. Transport sample to decontamination zone for preparation for transport to analytical laboratory.
9. On completion, remove the tubing from the well and either replace the Teflon tubing and bladder with new dedicated tubing and bladder or rigorously decontaminate the existing material.
10. Collect non-filtered samples directly from the outlet tubing into the sample bottle.
11. For filtered samples, connect the pump outlet tubing directly to the filter unit. The pump pressure should remain decreased so that the pressure build-up on the filter does not blow out the pump bladder or displace the filter. For the Geotech barrel filter, no actual connections are necessary so this is not a concern.

### *Non-Gas Contact Bladder Pump*

The use of a non-gas contact positive displacement bladder pump is often mandated by the use of dedicated pumps installed in wells. These pumps are also suitable for shallow (less than 100 feet) wells. They are somewhat difficult to clean, but may be used with dedicated sample tubing to avoid cleaning. These pumps require a power supply and a compressed gas supply (or compressor). They may be operated at variable flow and pressure rates making them ideal for both purging and sampling.

Barcelona (1984) and Nielsen (1985) report that the non-gas contact positive displacement pumps cause the least amount of alteration in sample integrity as compared to other sample retrieval methods.

1. Allow well to recharge after purging.
2. Assemble the appropriate bottles.

### *Suction Pump*

In view of the limitations of suction pumps, they are not recommended for sampling purposes.

### *Inertia Pump*

Inertia pumps may be used to collect samples. It is more common, however, to purge with these pumps and sample with a bailer.

1. Following well evacuation, allow the well to recharge.
2. Assemble the appropriate bottles.

3. Since these pumps are manually operated, the flow rate may be regulated by the sampler. The sample may be discharged from the pump outlet directly into the appropriate sample container.
4. Cap the sample container tightly and place pre-labeled sample container in a carrier.
5. Replace the well cap.
6. Log all samples in the site logbook and on field data sheets and label all samples.
7. Package samples and complete necessary paperwork.
8. Transport sample to decontamination zone for preparation for transport to analytical laboratory.
9. Upon completion, remove pump and decontaminate or discard, as appropriate.

### 2.7.5 Filtering

For samples that require filtering, such as samples which will be analyzed for total metals, the filter must be decontaminated prior to use and between uses. Filters work by two methods. A barrel filter such as the "Geotech" filter works with a bicycle pump, which is used to build up positive pressure in the chamber containing the sample. The sample is then forced through the filter paper (minimum size 0.45  $\mu\text{m}$ ) into a jar placed underneath. The barrel itself is filled manually from the bailer or directly via the hose of the sampling pump. The pressure must be maintained up to 30 psi by periodic pumping.

A vacuum type filter involves two chambers, the upper chamber contains the sample and a filter (minimum size 0.45  $\mu\text{m}$ ) divides the chambers. Using a hand pump or a Gilian type pump, air is withdrawn from the lower chamber, creating a vacuum and thus causing the sample to move through the filter into the lower chamber where it is drained into a sample jar, repeated pumping may be required to drain all the sample into the lower chamber. If preservation of the sample is necessary, this should be done after filtering.

### 2.7.6 Post Operation

After all samples are collected and preserved, the sampling equipment should be decontaminated prior to sampling another well. This will prevent cross-contamination of equipment and monitoring wells between locations.

1. Decontaminate all equipment.
2. Replace sampling equipment in storage containers.
3. Prepare and transport water samples to the laboratory. Check sample documentation and make sure samples are properly packed for shipment.

### 2.7.7 Special Considerations for VOA Sampling

The proper collection of a sample for volatile organics requires minimal disturbance of the sample to limit volatilization and therefore a loss of volatiles from the sample.

Sample retrieval systems suitable for the valid collection of volatile organic samples are: positive displacement bladder pumps, gear driven submersible pumps, syringe samplers and bailers (Barcelona, 1984; Nielsen, 1985). Field conditions and other constraints will limit the choice of appropriate systems. The focus of concern must be to provide a valid sample for analysis, one which has been subjected to the least amount of turbulence possible.

The following procedures should be followed:

1. Open the vial, set cap in a clean place, and collect the sample during the middle of the cycle. When collecting duplicates, collect both samples at the same time.
2. Fill the vial to just overflowing. Do not rinse the vial, nor excessively overfill it. There should be a convex meniscus on the top of the vial.
3. Check that the cap has not been contaminated (splashed) and carefully cap the vial. Place the cap directly over the top and screw down firmly. Do not overtighten and break the cap.

4. Invert the vial and tap gently. Observe vial for at least 10 seconds. If an air bubble appears, discard the sample and begin again. It is imperative that no entrapped air is in the sample vial.
5. Immediately place the vial in the protective foam sleeve and place into the cooler, oriented so that it is lying on its side, not straight up.
6. The holding time for VOAs is 7 days. Samples should be shipped or delivered to the laboratory daily so as not to exceed the holding time. Ensure that the samples remain at 4°C, but do not allow them to freeze.

## 2.8 CALCULATIONS

There are no calculations necessary to implement this procedure. However, if it is necessary to calculate the volume of the well, utilize the following equation:

$$\text{Well volume} = \pi r^2 h (cf) \quad [\text{Equation 1}]$$

where:

- $\pi$  = pi
- $r$  = radius of monitoring well (feet)
- $h$  = height of the water column (feet)  
[This may be determined by subtracting the depth to water from the total depth of the well as measured from the same reference point.]
- $cf$  = conversion factor (gal/ft<sup>3</sup>) = 7.48 gal/ft<sup>3</sup> [In this equation, 7.48 gal/ft<sup>3</sup> is the necessary conversion factor.]

Monitoring wells are typically 2, 3, 4, or 6 inches in diameter. If you know the diameter of the monitoring well, there are a number of standard conversion factors which can be used to simplify the equation above.

The volume, in gallons per linear foot, for various standard monitoring well diameters can be calculated as follows:

$$v = \pi r^2 (cf) \quad [\text{Equation 2}]$$

where:

- $v$  = volume in gallons per linear foot
- $\pi$  = pi
- $r$  = radius of monitoring well (feet)
- $cf$  = conversion factor (7.48 gal/ft<sup>3</sup>)

For a 2-inch diameter well, the volume in gallons per linear foot can be calculated as follows:

$$\begin{aligned} v &= \pi r^2 (cf) \quad [\text{Equation 2}] \\ &= 3.14 (1/12 \text{ ft})^2 7.48 \text{ gal/ft}^3 \\ &= 0.1632 \text{ gal/ft} \end{aligned}$$

Remember that if you have a 2-inch diameter well, you must convert this to the radius in feet to be able to use the equation.

The volume in gallons per linear foot for the common size monitoring wells are as follows:

Well Diameter	$v$ (volume in gal/ft.)
2 inches	0.1632
3 inches	0.3672
4 inches	0.6528
6 inches	1.4688

If you utilize the conversion factors above, Equation 1 should be modified as follows:

$$\text{Well volume} = (b)(v) \quad [\text{Equation 3}]$$

where:

- $h$  = height of water column (feet)
- $v$  = volume in gallons per linear foot as calculated from Equation 2

## 2.9 QUALITY ASSURANCE/QUALITY CONTROL

There are no specific quality assurance activities which apply to the implementation of these procedures. However, the following general QA procedures apply:

- All data must be documented on field data sheets or within site logbooks.
- All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless

## 5.0 WATER LEVEL MEASUREMENT: SOP #2151

### 5.1 SCOPE AND APPLICATION

The purpose of this Standard Operating Procedure (SOP) is to set guidelines for the determination of the depth to water in an open borehole, cased borehole, monitoring well or piezometer.

Generally, water level measurements from boreholes, piezometers, or monitoring wells are used to construct water table or potentiometric surface maps. Therefore, all water level measurements at a given site should be collected within a 24-hour period. Certain situations may necessitate that all water level measurements be taken within a shorter time interval. These situations may include:

- the magnitude of the observed changes between wells appears too large
- atmospheric pressure changes
- aquifers which are tidally influenced
- aquifers affected by river stage, impoundments, and/or unlined ditches
- aquifers stressed by intermittent pumping of production wells
- aquifers being actively recharged due to precipitation events

### 5.2 METHOD SUMMARY

A survey mark should be placed on the casing for use as a reference point for measurement. Many times the lip of the riser pipe is not flat. Another measuring reference should be located on the grout apron. The measuring point should be documented in the site logbook and on the groundwater level data form (see Appendix C).

Water levels in piezometers and monitoring wells should be allowed to stabilize for a minimum of 24 hours after well construction and development, prior to measurement. In low yield situations, recovery may take longer.

Working with decontaminated equipment, proceed from the least to the most contaminated wells. Open the well and monitor headspace with the appropriate monitoring instrument to determine the presence of volatile organic compounds. Lower the water level measurement device into the well until water surface or bottom of casing is encountered. Measure distance from water surface to the reference point on the well casing and record in the site logbook and/or groundwater level data form. Remove all downhole equipment, decontaminate as necessary, and replace well casing cap.

### 5.3 SAMPLE PRESERVATION, CONTAINERS, HANDLING AND STORAGE

This section is not applicable to this SOP.

### 5.4 INTERFERENCES AND POTENTIAL PROBLEMS

- The chalk used on steel tape may contaminate the well.
- Cascading water may obscure the water mark or cause it to be inaccurate.
- Many types of electric sounders use metal indicators at 5-foot intervals around a conducting wire. These intervals should be checked with a surveyor's tape to ensure accuracy.
- If there is oil present on the water, it can insulate the contacts of the probe on an electric sounder or give false readings due to thickness of the oil. Determining the thickness and density of the oil layer may be warranted, in order to determine the correct water level.
- Turbulence in the well and/or cascading water can make water level determination difficult with either an electric sounder or steel tape.

- An airline measures drawdown during pumping. It is only accurate to 0.5 foot unless it is calibrated for various "drawdowns".

## 5.5 EQUIPMENT/APPARATUS

There are a number of devices which can be used to measure water levels, such as steel tape or airlines. The device should be adequate to attain an accuracy of 0.01 feet.

The following equipment is needed to measure water levels:

- air monitoring equipment
- water level measurement device
- electronic water level indicator
- metal tape measure
- airline
- steel tape
- chalk
- ruler
- notebook
- paper towels
- decontamination solution and equipment
- groundwater level data forms

## 5.6 REAGENTS

No chemical reagents are used in this procedure, with the exception of decontamination solutions. Where decontamination of equipment is required, refer to ERT SOP #2006, Sampling Equipment Decontamination and the site-specific work plan.

## 5.7 PROCEDURES

### 5.7.1 Preparation

1. Determine the extent of the sampling effort, the sampling methods to be employed, and which equipment and supplies are needed.
2. Obtain necessary sampling and monitoring equipment.
3. Decontaminate or preclean equipment, and ensure that it is in working order.
4. Prepare scheduling and coordinate with staff,

clients, and regulatory agency, if appropriate.

5. Perform a general site survey prior to site entry in accordance with the site-specific health and safety plan.
6. Identify and mark all sampling locations.

### 5.7.2 Procedures

1. Make sure water level measuring equipment is in good operating condition.
2. If possible and where applicable, start at those wells that are least contaminated and proceed to those wells that are most contaminated.
3. Clean all equipment entering the well by the following decontamination procedure:
  - Triple rinse equipment with deionized water.
  - Wash equipment with an Alconox solution followed by a deionized water rinse.
  - Rinse with an approved solvent (e.g., methanol, isopropyl alcohol, acetone) as per the work plan, if organic contamination is suspected.
  - Place equipment on clean surface such as a Teflon or polyethylene sheet.
4. Remove locking well cap, note location, time of day, and date in site notebook; or an appropriate groundwater level data form.
5. Remove well casing cap.
6. If required by site-specific condition, monitor headspace of well with PID or FID to determine presence of volatile organic compounds and record in site logbook.
7. Lower electric water level measuring device or equivalent (i.e., permanently installed transducers or airline) into the well until water surface is encountered.
8. Measure the distance from the water surface to the reference measuring point on the well casing or protective barrier post and record in the field logbook. In addition, note that the

water level measurement was from the top of the steel casing, top of the PVC riser pipe, from the ground surface, or from some other position on the well head.

9. The groundwater level data form in Appendix C should be completed as follows:

- site name
- logger name: person taking field notes
- date: the date when the water levels are being measured
- location: monitor well number and physical location
- time: the military time at which the water level measurement was recorded
- depth to water: the water level measurement in feet, or in tenths or hundreds of feet, depending on the equipment used
- comments: any information the field personnel feels to be applicable
- measuring point: marked measuring point on PVC riser pipe, protective steel casing or concrete pad surrounding well casing from which all water level measurements for individual wells should be measured. This provides consistency in future water level measurements.

10. Measure total depth of well (at least twice to confirm measurement) and record in site notebook or on log form.

11. Remove all downhole equipment, replace well casing cap and lock steel caps.

12. Rinse all downhole equipment and store for transport to next well.

13. Note any physical changes such as erosion or cracks in protective concrete pad or variation in total depth of well in field notebook and on field data sheets.

14. Decontaminate all equipment as outlined in Step 3 above.

## 5.8 CALCULATIONS

To determine groundwater elevation above mean sea level, use the following equation:

$$E_w = E - D$$

where:

- $E_w$  = Elevation of water above mean sea level
- $E$  = Elevation above sea level at point of measurement
- $D$  = Depth to water

## 5.9 QUALITY ASSURANCE/ QUALITY CONTROL

The following general quality assurance procedures apply:

- All data must be documented on standard chain of custody forms, field data sheets or within personal/site logbooks.
- All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment checkout and calibration activities must occur prior to sampling/operation, and they must be documented.
- Each well should be tested at least twice in order to compare results.

## 5.10 DATA VALIDATION

This section is not applicable to this SOP.

## 5.11 HEALTH AND SAFETY

When working with potentially hazardous materials, follow U.S. EPA, OSHA, and specific health and safety procedures.

# **COMPENDIUM OF ERT WASTE SAMPLING PROCEDURES**

**Sampling Equipment Decontamination**

**Drum Sampling**

**Tank Sampling**

**Chip, Wipe, and Sweep Sampling**

**Waste Pile Sampling**

**Interim Final**

**Environmental Response Team  
Emergency Response Division**

**Office of Emergency and Remedial Response  
U.S. Environmental Protection Agency  
Washington, DC 20460**



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## 2.0 DRUM SAMPLING: SOP #2009

### 2.1 SCOPE AND APPLICATION

The purpose of this Standard Operating Procedure (SOP) is to provide technical guidance on safe and cost-effective response actions at hazardous waste sites containing drums with unknown contents. Container contents are sampled and characterized for disposal, bulking, recycling, grouping, and/or classification purposes.

### 2.2 METHOD SUMMARY

Prior to sampling, drums must be inventoried, staged, and opened. An inventory entails recording visual qualities of each drum and any characteristics pertinent to the contents' classification. Staging involves the organization, and sometimes consolidation of drums which have similar wastes or characteristics. Opening of closed drums can be performed manually or remotely. Remote drum opening is recommended for worker safety. The most widely used method of sampling a drum involves the use of a glass thief. This method is quick, simple, relatively inexpensive, and requires no decontamination.

### 2.3 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

Samples collected from drums are considered waste samples. No preservatives should be added since there is a potential reaction of the sample with the preservative. Samples should, however, be cooled to 4°C and protected from sunlight in order to minimize any potential reaction due to the light sensitivity of the sample.

Sample bottles for collection of waste liquids, sludges, or solids are typically wide-mouth amber jars with Teflon-lined screw caps. Actual volume required for analysis should be determined in conjunction with the laboratory performing the analysis.

Follow these waste sample handling procedures:

1. Place sample container in two Ziploc plastic bags.

2. Place each bagged container in a 1-gallon covered can containing absorbent packing material. Place the lid on the can.
3. Mark the sample identification number on the outside of the can.
4. Place the marked cans in a cooler, and fill remaining space with absorbent packing material.
5. Fill out chain of custody form for each cooler, place in plastic, and affix to inside lid of cooler.
6. Secure and custody seal the lid of cooler.
7. Arrange for the appropriate transportation mode consistent with the type of hazardous waste involved.

### 2.4 INTERFERENCES AND POTENTIAL PROBLEMS

The practice of tapping drums to determine their contents is neither safe nor effective and should not be used if the drums are visually overpressurized or if shock-sensitive materials are suspected. A laser thermometer may be used instead.

Drums that have been overpressurized, to the extent that the head is swollen several inches above the level of the chime, should not be moved. A number of devices have been developed for venting critically swollen drums. One method that has proven to be effective is a tube and spear device. A light aluminum tube (3 meters long) is positioned at the vapor space of the drum. A rigid, hooking device attached to the tube goes over the chime and holds the tube securely in place. The spear is inserted in the tube and positioned against the drum wall. A sharp blow on the end of the spear drives the sharpened tip through the drum and the gas vents along the grooves. The venting should be done from behind a wall or barricade. This device can be cheaply and easily designed and constructed where needed. Once the pressure has been relieved, the bung can be removed and the drum sampled.

## 2.5 EQUIPMENT/APPARATUS

The following are standard materials and equipment required for sampling:

- personal protection equipment
- wide-mouth glass jars with Teflon cap liner, approximately 500 mL volume
- uniquely numbered sample identification labels with corresponding data sheets
- 1-gallon covered cans half-filled with absorbent (vermiculite)
- chain of custody forms
- decontamination materials
- glass thief tubes or Composite Liquid Waste Samplers (COLWASA)
- laser thermometer
- drum opening devices

Drum opening devices include the following:

### 2.5.1 Bung Wrench

A common method for opening drums manually is using a universal bung wrench. These wrenches have fittings made to remove nearly all commonly encountered bungs. They are usually constructed of cast iron, brass, or a bronze-beryllium, non-sparking alloy formulated to reduce the likelihood of sparks. The use of a non-sparking bung wrench does not completely eliminate the possibility of a spark being produced. (See Figure 1, Appendix B.)

### 2.5.2 Drum Deheader

When a bung is not removable with a bung wrench, a drum can be opened manually by using a drum deheader. This tool is constructed of forged steel with an alloy steel blade and is designed to cut the lid of a drum off or part way off by means of a scissors-like cutting action. A limitation of this device is that it can be attached only to closed head drums. Drums with removable heads must be opened by other means. (See Figure 2, Appendix B.)

### 2.5.3 Hand Pick, Pickaxe, and Hand Spike

These tools are usually constructed of brass or a non-sparking alloy with a sharpened point that can penetrate the drum lid or head when the tool is swung. The hand picks or pickaxes that are most

commonly used are commercially available; whereas the spikes are generally uniquely fabricated 4-foot long poles with a pointed end. (See Figure 3, Appendix B.)

### 2.5.4 Backhoe Spike

The most common means used to open drums remotely for sampling is the use of a metal spike attached or welded to a backhoe bucket. In addition to being very efficient, this method can greatly reduce the likelihood of personal exposure. (See Figure 4, Appendix B.)

### 2.5.5 Hydraulic Drum Opener

Another remote method for opening drums is with remotely operated hydraulic devices. One such device uses hydraulic pressure to pierce through the wall of a drum. It consists of a manually operated pump which pressurizes soil through a length of hydraulic line. (See Figure 5, Appendix B.)

### 2.5.6 Pneumatic Devices

A pneumatic bung remover consists of a compressed air supply that is controlled by a heavy-duty, two-stage regulator. A high-pressure air line of desired length delivers compressed air to a pneumatic drill, which is adapted to turn a bung fitting selected to fit the bung to be removed. An adjustable bracketing system has been designed to position and align the pneumatic drill over the bung. This bracketing system must be attached to the drum before the drill can be operated. Once the bung has been loosened, the bracketing system must be removed before the drum can be sampled. This remote bung opener does not permit the slow venting of the container, and therefore appropriate precautions must be taken. It also requires the container to be upright and relatively level. Bungs that are rusted shut cannot be removed with this device. (See Figure 6, Appendix B.)

## 2.6 REAGENTS

Reagents are not typically required for preserving drum samples. However, reagents are used for decontaminating sampling equipment. Decontamination solutions are specified in ERT SOP #2006, Sampling Equipment Decontamination.

## 2.7 PROCEDURES

### 2.7.1 Preparation

1. Determine the extent of the sampling effort, the sampling methods to be employed, and which equipment and supplies are needed.
2. Obtain necessary sampling and monitoring equipment.
3. Decontaminate or preclean equipment, and ensure that it is in working order.
4. Prepare scheduling and coordinate with staff, clients, and regulatory agency, if appropriate.
5. Perform a general site survey prior to site entry in accordance with the site-specific health and safety plan.
6. Use stakes, flagging, or buoys to identify and mark all sampling locations. If required, the proposed locations may be adjusted based on site access, property boundaries, and surface obstructions.

### 2.7.2 Drum Inspection

Appropriate procedures for handling drums depend on the contents. Thus, prior to any handling, drums should be visually inspected to gain as much information as possible about their contents. Those in charge of inspections should be on the look-out for:

- drum condition, corrosion, rust, and leaking contents
- symbols, words, or other markings on the drum indicating hazards (i.e., explosive, radioactive, toxic, flammable)
- signs that the drum is under pressure
- shock sensitivity

Monitor around the drums with radiation instruments, organic vapor monitors (OVA) and combustible gas indicators (CGI).

Classify the drums into categories, for instance:

- radioactive
- leaking/deteriorating
- bulging
- drums containing lab packs
- explosive/shock sensitive

All personnel should assume that unmarked drums contain hazardous materials until their contents have been categorized, and that labels on drums may not accurately describe their contents.

If it is presumed that there are buried drums on-site, geophysical investigation techniques such as magnetometry, ground penetrating radar, and metal detection can be employed in an attempt to determine depth and location of the drums. See ERT SOP #2159, General Surface Geophysics.

### 2.7.3 Drum Staging

Prior to sampling, the drums should be staged to allow easy access. Ideally, the staging area should be located just far enough from the drum opening area to prevent a chain reaction if one drum should explode or catch fire when opened.

While staging, physically separate the drums into the following categories: those containing liquids, those containing solids, lab packs, or gas cylinders, and those which are empty. This is done because the strategy for sampling and handling drums/containers in each of these categories will be different. This may be achieved by:

- Visual inspection of the drum and its labels, codes, etc. Solids and sludges are typically disposed of in open-top drums. Closed-head drums with a bung opening generally contain liquid.
- Visual inspection of the contents of the drum during sampling followed by restaging, if needed.

Once a drum has been excavated and any immediate hazard has been eliminated, by overpacking or transferring the drum's contents, affix a numbered tag to the drum and transfer it to a staging area. Color-coded tags, labels, or bands should be used to mark similar waste types. Record a description of each drum, its condition, any unusual markings, and the location where it was buried or stored, on a drum data sheet (Appendix A). This data sheet becomes the principal

recordkeeping tool for tracking the drum onsite.

Where there is good reason to suspect that some drums contain radioactive, explosive, and shock-sensitive materials, these drums should be staged in a separate, isolated area. Placement of explosives and shock-sensitive materials in diked and fenced areas will minimize the hazard and the adverse effects of any premature detonation of explosives.

Where space allows, the drum opening area should be physically separated from the drum removal and drum staging operations. Drums are moved from the staging area to the drum opening area one at a time using forklift trucks equipped with drum grabbers or a barrel grappler. In a large-scale drum handling operation, drums may be conveyed to the drum opening area using a roller conveyor.

#### 2.7.4 Drum Opening

There are three basic techniques available for opening drums at hazardous waste sites:

- Manual opening with non-sparking bung wrenches,
- Drum deheading, and
- Remote drum puncturing or bung removal.

The choice of drum opening techniques and accessories depends on the number of drums to be opened, their waste contents, and physical condition. Remote drum opening equipment should always be considered in order to protect worker safety. Under OSHA 1910.120, manual drum opening with bung wrenches or deheaders should be performed only with structurally sound drums having contents that are known to be (1) not shock sensitive, (2) non-reactive, (3) non-explosive, and (4) non-flammable.

##### *Manual Drum Opening with a Bung Wrench*

Manual drum opening with bung wrenches (Figure 1, Appendix B) should not be performed unless the drums are structurally sound (no evidence of bulging or deformation) and their contents are known to be non-explosive. If opening the drum with bung wrenches is deemed reasonably cost-effective and safe, then follow these procedures to minimize the hazard:

1. Fully outfit field personnel with protective gear.
2. Position drum upright with the bung up, or, for drums with bungs on the side, lay the drum on its side with the bung plug up.
3. Wrench the bung with a slow, steady pulling motion across the drum. If the length of the bung wrench handle provides inadequate leverage for unscrewing the plug, attach a "cheater bar" to the handle to improve leverage.

##### *Manual Drum Opening with a Drum Deheader*

Drums are opened with a drum deheader (Figure 2, Appendix B) by first positioning the cutting edge just inside the top chime and then tightening the adjustment screw so that the deheader is held against the side of the drum. Moving the handle of the deheader up and down while sliding the deheader along the chime will cut off the entire top. If the top chime of a drum has been damaged or badly dented, it may not be possible to cut off the entire top. Since there is always the possibility that a drum may be under pressure, make the initial cut very slowly to allow for the gradual release of any built-up pressure. A safer technique would be to use a remote method to puncture the drum prior to using the deheader.

Self-propelled drum openers which are either electrically or pneumatically driven can be used for quicker and more efficient deheading.

##### *Manual Drum Opening with a Hand Pick, Pickaxe, or Spike*

When a drum must be opened and neither a bung wrench nor a drum deheader is suitable, the drum can be opened for sampling by using a hand pick, pickaxe, or spike (Figure 3, Appendix B). Often the drum lid or head must be hit with a great deal of force in order to penetrate it. The potential for splash or spraying is greater than with other opening methods and, therefore, this method of drum opening is not recommended, particularly when opening drums containing liquids. Some spikes used have been modified by the addition of a circular splash plate near the penetrating end. This plate acts as a shield and reduces the amount of splash in the direction of the person using the spike. Even with this shield, good splash gear is essential.

Since drums cannot be opened slowly with these tools, spray from drums is common requiring appropriate safety measures. Decontaminate the pick or spike after each drum is opened to avoid cross-contamination and/or adverse chemical reaction from incompatible materials.

### *Remote Drum Opening with a Backhoe Spike*

Remotely operated drum opening tools are the safest available means of drum opening. Remote drum opening is slow, but is much safer compared to manual methods of opening.

Drums should be "staged" or placed in rows with adequate aisle space to allow ease in backhoe maneuvering. Once staged, the drums can be quickly opened by punching a hole in the drum head or lid with the spike.

The spike (Figure 4, Appendix B) should be decontaminated after each drum is opened to prevent cross-contamination. Even though some splash or spray may occur when this method is used, the operator of the backhoe can be protected by mounting a large shatter-resistant shield in front of the operator's cage. This, combined with the required level of personal protection gear, should be sufficient to protect the operator. Additional respiratory protection can be afforded by providing the operator with an on-board airline system.

### *Remote Drum Opening with Hydraulic Devices*

A piercing device with a metal point is attached to the end of a hydraulic line and is pushed into the drum by hydraulic pressure (Figure 5, Appendix B). The piercing device can be attached so that the sampling hole can be made on either the side or the head of the drum. Some of the metal piercers are hollow or tube-like so that they can be left in place if desired and serve as a permanent tap or sampling port. The piercer is designed to establish a tight seal after penetrating the container.

### *Remote Drum Opening with Pneumatic Devices*

Pneumatically-operated devices utilizing compressed air have been designed to remove drum bungs remotely (Figure 6, Appendix B).

## 2.7.5 Drum Sampling

After the drum has been opened, monitor headspace gases using an explosimeter and organic vapor analyzer. In most cases it is impossible to observe the contents of these sealed or partially sealed vessels. Since some layering or stratification is likely in any solution left undisturbed over time, take a sample that represents the entire depth of the vessel.

When sampling a previously sealed vessel, check for the presence of a bottom sludge. This is easily accomplished by measuring the depth to the apparent bottom, then comparing it to the known interior depth.

### *Glass Thief Sampler*

The most widely used implement for sampling is a glass tube commonly referred to as a glass thief (Figure 7, Appendix B). This tool is simple, cost-effective, quick, and collects a sample without having to decontaminate. Glass thieves are typically 6mm to 16mm I.D. and 48 inches long.

Procedures for using a glass thief are as follows:

1. Remove cover from sample container.
2. Insert glass tubing almost to the bottom of the drum or until a solid layer is encountered. About one foot of tubing should extend above the drum.
3. Allow the waste in the drum to reach its natural level in the tube.
4. Cap the top of the sampling tube with a tapered stopper or thumb, ensuring liquid does not come into contact with stopper.
5. Carefully remove the capped tube from the drum and insert the uncapped end in the sample container.
6. Release stopper and allow the glass thief to drain until the container is approximately 2/3 full.
7. Remove tube from the sample container, break it into pieces and place the pieces in the drum.

8. Cap the sample container tightly and place prelabeled sample container in a carrier.
9. Replace the bung or place plastic over the drum.
10. Log all samples in the site logbook and on field data sheets.
11. Package samples and complete necessary paperwork.
12. Transport sample to decontamination zone to prepare it for transport to the analytical laboratory.

In many instances a drum containing waste material will have a sludge layer on the bottom. Slow insertion of the sample tube down into this layer and then a gradual withdrawal will allow the sludge to act as a bottom plug to maintain the fluid in the tube. The plug can be gently removed and placed into the sample container by the use of a stainless steel lab spoon.

It should be noted that in some instances disposal of the tube by breaking it into the drum may interfere with eventual plans for the removal of its contents. This practice should be cleared with the project officer or other disposal techniques evaluated.

### **COLIWASA Sampler**

Some equipment is designed to collect a sample from the full depth of a drum and maintain it in the transfer tube until delivery to the sample bottle. These designs include primarily the Composite Liquid Waste Sampler (COLIWASA) and modifications thereof. The COLIWASA (Figure 8, Appendix B) is a much cited sampler designed to permit representative sampling of multiphase wastes from drums and other containerized wastes. One configuration consists of a 152 cm by 4 cm I.D. section of tubing with a neoprene stopper at one end attached by a rod running the length of the tube to a locking mechanism at the other end.

Manipulation of the locking mechanism opens and closes the sampler by raising and lowering the neoprene stopper. One model of the COLIWASA is shown in Appendix B; however, the design can be modified and/or adapted somewhat to meet the needs of the sampler.

The major drawbacks associated with using a COLIWASA concern decontamination and costs. The sampler is difficult, if not impossible to decontaminate in the field and its high cost in relation to alternative procedures (glass tubes) make it an impractical throwaway item. It still has applications, however, especially in instances where a true representation of a multiphase waste is absolutely necessary.

Follow these procedures for using the COLIWASA:

1. Put the sampler in the open position by placing the stopper rod handle in the T-position and pushing the rod down until the handle sits against the sampler's locking block.
2. Slowly lower the sampler into the liquid waste. Lower the sampler at a rate that permits the levels of the liquid inside and outside the sampler tube to be about the same. If the level of the liquid in the sample tube is lower than that outside the sampler, the sampling rate is too fast and will result in a non-representative sample.
3. When the sampler stopper hits the bottom of the waste container, push the sample tube downward against the stopper to close the sampler. Lock the sampler in the closed position by turning the T-handle until it is upright and one end rests tightly on the locking block.
4. Slowly withdraw the sample from the waste container with one hand while wiping the sampler tube with a disposable cloth or rag with the other hand.
5. Carefully discharge the sample into a suitable sample container by slowly pulling the lower end of the T-handle away from the locking block while the lower end of the sampler is positioned in a sample container.
6. Cap the sample container tightly and place prelabeled sample container in a carrier.
7. Replace the bung or place plastic over the drum.
8. Log all samples in the site logbook and on field data sheets.

## 3.0 TANK SAMPLING: SOP #2010

### 3.1 SCOPE AND APPLICATION

The purpose of this Standard Operating Procedure (SOP) is to provide protocols for sampling tanks and other confined spaces from outside the vessel.

### 3.2 METHOD SUMMARY

The safe collection of a representative sample should be the criterion for selecting sample locations. A representative sample can be collected using techniques or equipment that are designed for obtaining liquids or sludges from various depths. The structure and characteristics of storage tanks present problems with collection of samples from more than one location; therefore, the selection of sampling devices is an important consideration.

Depending on the type of vessel and characteristics of the material to be sampled, one can choose a bailer, glass thief, bacon bomb sampler, sludge judge, COLIWASA, or subsurface grab sampler to collect the sample. For depths of less than 5-feet, a bailer, COLIWASA, or sludge judge can be used. A sludge judge, subsurface grab sampler, bailer, or bacon bomb sampler can be used for depths greater than 5-feet. A sludge judge or bacon bomb can be used to determine if the tank consists of various strata.

All sample locations should be surveyed for air quality prior to sampling. At no time should sampling continue with an LEL reading greater than 25%.

All personnel involved in tank sampling should be advised as to the hazards associated with working in unfavorable conditions.

### 3.3 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

Samples collected from tanks are considered waste samples and, as such, addition of preservatives is not required due to the potential reaction of the sample with the preservative. Samples should,

however, be cooled to 4°C and protected from sunlight in order to minimize any potential reaction due to the light sensitivity of the sample.

Sample bottles for collection of waste liquids, sludges, or solids are typically wide-mouth amber jars with Teflon-lined screw caps. Actual volume required for analysis should be determined in conjunction with the laboratory performing the analysis.

Waste sample handling procedures should be as follows:

1. Place sample container in two Ziploc plastic bags.
2. Place each bagged container in a 1-gallon covered can containing absorbent packing material. Place the lid on the can.
3. Mark the sample identification number on the outside of the can.
4. Place the marked cans in a cooler, and fill remaining space with absorbent packing material.
5. Fill out a chain of custody form for each cooler, place it in plastic, and affix it to the inside lid of the cooler.
6. Secure and custody seal the lid of cooler.
7. Arrange for the transportation appropriate for the type of hazardous waste involved.

### 3.4 INTERFERENCES AND POTENTIAL PROBLEMS

Sampling a storage tank requires a great deal of manual dexterity, often requiring the sampler to climb to the top of the tank upon a narrow vertical or spiral stairway or ladder while wearing protective clothing and carrying sampling equipment.

Before climbing onto the vessel, perform a structural survey of the tank to ensure the sampler's

safety and accessibility prior to initiating field activities.

As in all opening of containers, take extreme caution to avoid ignition or combustion of volatile contents. All tools used must be constructed of a non-sparking material and electronic instruments must be intrinsically safe.

All sample locations should be surveyed for air quality prior to sampling. At no time should sampling continue with an LEL reading greater than 25%.

### 3.5 EQUIPMENT/APPARATUS

Storage tank materials include liquids, sludges, still bottoms, and solids of various structures. The type of sampling equipment chosen should be compatible with the waste. Samplers commonly used for tanks include: the bacon bomb sampler, the sludge judge, glass thief, bailer, COLIWASA, and subsurface grab sampler.

- sampling plan
- safety equipment
- tape measure
- weighted tape line or equivalent
- camera/film
- stainless steel bucket or bowl
- sample containers
- Ziploc plastic bags
- logbook
- labels
- field data sheets
- chain of custody forms
- flashlight (explosion proof)
- coolers
- ice
- decontamination supplies
- bacon bomb sampler
- sludge judge
- glass thief
- bailer
- COLIWASA
- subsurface grab sampler
- water/oil level indicator
- OVA (organic vapor analyzer or equivalent)
- explosimeter/oxygen meter
- high volume blower

### 3.6 REAGENTS

Reagents are not typically required for the preservation of waste samples. However, reagents will be utilized for decontamination of equipment. Decontamination solutions required are specified in ERT SOP #2006, Sampling Equipment Decontamination.

### 3.7 PROCEDURES

#### 3.7.1 Preparation

1. Determine the extent of the sampling effort, the sampling methods to be employed, and which equipment and supplies are needed.
2. Obtain necessary sampling and monitoring equipment.
3. Decontaminate or preclean equipment, and ensure that it is in working order.
4. Prepare scheduling and coordinate with staff, clients, and regulatory agency, if appropriate.
5. Perform a general site survey prior to site entry in accordance with the site-specific health and safety plan.
6. Identify and mark all sampling locations.

#### 3.7.2 Preliminary Inspection

1. Inspect the external structural characteristics of each tank and record in the site logbook. Potential sampling points should be evaluated for safety, accessibility, and sample quality.
2. Prior to opening a tank for internal inspection, the tank sampling team should:
  - Review safety procedures and emergency contingency plans with the Safety Officer,
  - Ensure that the tank is properly grounded,
  - Remove all sources of ignition from the immediate area.
3. Each tank should be mounted using appropriate means. Remove manway covers using non-sparking tools.



4. Collect air quality measurements for each potential sample location using an explosimeter/oxygen meter for a lower explosive limit (LEL/O<sub>2</sub>) reading and an OVA/HNU for an organic vapor concentration. Both readings should be taken from the tank headspace, above the sampling port, and in the breathing zone.
5. Prior to sampling, the tank headspace should be cleared of any toxic or explosive vapor concentration using a high volume blower. No work should start if LEL readings exceed 25%. At 10% LEL, work can continue but with extreme caution.

### 3.7.3 Sampling Procedures

1. Determine the depth of any and all liquid-solid interface, and depth of sludge using a weighted tape measure, probe line, sludge judge, or equivalent.
2. Collect liquid samples from 1-foot below the surface, from mid-depth of liquid, and from 1-foot above the bottom sludge layer. This can be accomplished with a subsurface grab sampler or bacon bomb. For liquids less than 5-feet in depth, use a glass thief or COLIWASA to collect the sample.  
  
If sampling storage tanks, vacuum trucks, or process vessels, collect at least one sample from each compartment in the tank. Samples should always be collected through an opened hatch at the top of the tank. Valves near the bottom should not be used, because of their questionable or unknown integrity. If such a valve cannot be closed once opened, the entire tank contents may be lost to the ground surface. Also, individual strata cannot be sampled separately through a valve near the bottom.
3. Compare the three samples for visual phase differences. If phase differences appear, systematic iterative sampling should be performed. By halving the distance between two discrete sampling points, one can determine the depth of the phase change.
4. If another sampling port is available, sample as above to verify the phase information.

5. Measure the outside diameter of the tank and determine the volume of wastes using the depth measurements. (See Appendix C for calculations.)
6. Sludges can be collected using a bacon bomb sampler, glass thief, or sludge judge.
7. Record all information on the sample data sheet or site logbook. Label the container with the appropriate sample tag.
8. Decontaminate sampling equipment as per ERT SOP #2006, Sampling Equipment Decontamination.

### 3.7.4 Sampling Devices

#### Bacon Bomb Sampler

The bacon bomb sampler (Figure 9, Appendix B) is designed to collect material from various levels within a storage tank. It consists of a cylindrical body, usually made of chrome-plated brass and bronze with an internal tapered plunger that acts as a valve to admit the sample. A line attached to the top of the plunger opens and closes the valve. A line is attached to the removable top cover which has a locking mechanism to keep the plunger closed after sampling.

1. Attach the sample line and the plunger line to the sampler.
2. Measure and then mark the sampling line at the desired depth.
3. Gradually lower the bacon bomb sampler by the sample line until the desired level is reached.
4. When the desired level is reached, pull up on the plunger line and allow the sampler to fill before releasing the plunger line to seal off the sampler.
5. Retrieve the sampler by the sample line. Be careful not to pull up on the plunger line and thereby prevent accidental opening of the bottom valve.
6. Rinse or wipe off the exterior of the sampler body.

7. Position the sampler over the sample container and release its contents by pulling up on the plunger line.
8. Cap the sample container tightly and place pre-labeled sample container in a carrier.
9. Replace the bung or place plastic over the tank.
10. Log all samples in the site logbook and on field data sheets and label all samples.
11. Package samples and complete necessary paperwork.
12. Transport sample to decontamination zone to prepare it for transport to the analytical laboratory.

### *Sludge Judge*

A sludge judge (Figure 10, Appendix B) is used for obtaining an accurate reading of solids which can settle, in any liquid, to any depth. The sampler consists of 3/4-inch plastic pipe in 5-foot sections, marked at 1-foot increments, with screw-style fittings. The top section includes a nylon line for raising the sampler.

1. Lower the sludge judge to the bottom of the tank.
2. When the bottom has been reached, and the pipe has filled to surface level, tug slightly on the rope as you begin to raise the unit. This will seat the check valve, trapping the column of material.
3. When the unit has been raised clear of the tank liquid, the amount of sludge in the sample can be read using the 1-foot increments marked on the pipe sections.
4. By touching the pin extending from the bottom section against a hard surface, the material is released from the unit.
5. Cap the sample container tightly and place pre-labeled sample container in a carrier.
6. Replace the bung or place plastic over the tank.
7. Log all samples in the site logbook and on field data sheets and label all samples.

8. Package samples and complete necessary paperwork.
9. Transport sample to decontamination zone to prepare it for transport to the analytical laboratory.

### *Subsurface Grab Sampler*

Subsurface grab samplers (Figure 11, Appendix B) are designed to collect samples of liquids at various depths. The sampler is usually constructed of aluminum or stainless steel tubing, with a polypropylene or Teflon head that attaches to a 1-liter sample container.

1. Screw the sample bottle onto the sampling head.
2. Lower the sampler to the desired depth.
3. Pull the ring at the top which opens the spring-loaded plunger in the head assembly.
4. When the bottle is full, release the ring, lift sampler, and remove sample bottle.
5. Cap the sample container tightly and place pre-labeled sample container in a carrier.
6. Replace the bung or place plastic over the tank.
7. Log all samples in the site logbook and on field data sheets and label all samples.
8. Package samples and complete necessary paperwork.
9. Transport sample to decontamination zone to prepare it for transport to the analytical laboratory.

### *Glass Thief*

The most widely used implement for sampling is a glass tube commonly referred to as a glass thief (Figure 7, Appendix B). This tool is simple, cost effective, quick, and collects a sample without having to decontaminate. Glass thieves are typically 6mm to 16mm I.D. and 48 inches long.

1. Remove cover from sample container.
2. Insert glass tubing almost to the bottom of the

tank or until a solid layer is encountered. About 1 foot of tubing should extend above the tank.

3. Allow the waste in the tank to reach its natural level in the tube.
4. Cap the top of the sampling tube with a tapered stopper or thumb, ensuring liquid does not come into contact with stopper.
5. Carefully remove the capped tube from the tank and insert the uncapped end in the sample container. Do not spill liquid on the outside of the sample container.
6. Release stopper and allow the glass thief to drain until the container is approximately 2/3 full.
7. Remove tube from the sample container, break it into pieces and place the pieces in the tank.
8. Cap the sample container tightly and place prelabeled sample container in a carrier.
9. Replace the bung or place plastic over the tank.
10. Log all samples in the site logbook and on field data sheets and label all samples.
11. Package samples and complete necessary paperwork.
12. Transport sample to decontamination zone to prepare it for transport to the analytical laboratory.

In many instances a tank containing waste material will have a sludge layer on the bottom. Slow insertion of the sample tube down into this layer and then a gradual withdrawal will allow the sludge to act as a bottom plug to maintain the fluid in the tube. The plug can be gently removed and placed into the sample container by the use of a stainless steel lab spoon.

### **Bailer**

The positive-displacement volatile sampling bailer (manufactured by GPI or equivalent) (Figure 12, Appendix B) is perhaps the most appropriate for collecting water samples for volatile analysis. Other bailer types (messenger, bottom fill, etc.) are less

desirable, but may be mandated by cost and site conditions. Generally, bailers can provide an acceptable sample, providing that the sampling personnel use extra care in the collection process.

1. Make sure clean plastic sheeting surrounds the tank.
2. Attach a line to the bailer.
3. Lower the bailer slowly and gently into the tank so as not to splash the bailer into the tank contents.
4. Allow the bailer to fill completely and retrieve the bailer from the tank.
5. Begin slowly pouring from the bailer.
6. Cap the sample container tightly and place prelabeled sample container in a carrier.
7. Replace the bung or place plastic over the tank.
8. Log all samples in the site logbook and on field data sheets and label all samples.
9. Package samples and complete necessary paperwork.
10. Transport sample to decontamination zone to prepare it for transport to an analytical laboratory.

### **COLIWASA**

Some equipment is designed to collect a sample from the full depth of a tank and maintain it in the transfer tube until delivery to the sample bottle. These designs include primarily the Composite Liquid Waste Sampler (COLIWASA) (Figure 8, Appendix B) and modifications thereof. The COLIWASA is a much cited sampler designed to permit representative sampling of multiphase wastes from tanks and other containerized wastes. One configuration consists of a 152 cm by 4 cm I.D. section of tubing with a neoprene stopper at one end attached by a rod running the length of the tube to a locking mechanism at the other end. Manipulation of the locking mechanism opens and closes the sampler by raising and lowering the neoprene stopper.

The major drawbacks associated with using a COLIWASA concern decontamination and costs. The sampler is difficult if not impossible to decontaminate in the field and its high cost in relation to alternative procedures (glass tubes) make it an impractical throwaway item. It still has applications, however, especially in instances where a true representation of a multiphase waste is absolutely necessary.

1. Put the sampler in the open position by placing the stopper rod handle in the T-position and pushing the rod down until the handle sits against the sampler's locking block.
2. Slowly lower the sampler into the liquid waste. Lower the sampler at a rate that permits the levels of the liquid inside and outside the sampler tube to be about the same. If the level of the liquid in the sample tube is lower than that outside the sampler, the sampling rate is too fast and will result in a non-representative sample.
3. When the sampler stopper hits the bottom of the waste container, push the sampler tube downward against the stopper to close the sampler. Lock the sampler in the closed position by turning the T-handle until it is upright and one end rests tightly on the locking block.
4. Slowly withdraw the sample from the waste container with one hand while wiping the sampler tube with a disposable cloth or rag with the other hand.
5. Carefully discharge the sample into a suitable sample container by slowly pulling the lower end of the T-handle away from the locking block while the lower end of the sampler is positioned in a sample container.
6. Cap the sample container tightly and place prelabeled sample container in a carrier.
7. Replace the bung or place plastic over the tank.
8. Log all samples in the site logbook and on field data sheets and label all samples.
9. Package samples and complete necessary paperwork.
10. Transport sample to decontamination zone to

prepare it for transport to the analytical laboratory.

### 3.8 CALCULATIONS

Refer to Appendix C for calculations to determine tank volumes.

### 3.9 QUALITY ASSURANCE/ QUALITY CONTROL

There are no specific quality assurance activities which apply to the implementation of these procedures. However, the following general QA procedures apply:

- All data must be documented on field data sheets or within site logbooks.
- All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment checkout and calibration activities must occur prior to sampling/operation and they must be documented.

### 3.10 DATA VALIDATION

This section is not applicable to this SOP.

### 3.11 HEALTH AND SAFETY

When working with potentially hazardous materials, follow U.S. EPA, OSHA, and specific health and safety procedures. More specifically, the hazards associated with tank sampling may cause bodily injury, illness, or death to the worker. Failure to recognize potential hazards of waste containers is the cause of most accidents. It should be assumed that the most unfavorable conditions exist, and that the danger of explosion and poisoning will be present. Hazards specific to tank sampling are:

- Hazardous atmospheres can be flammable, toxic, asphyxiating, or corrosive.
- If activating electrical or mechanical equipment would cause injury, each piece of equipment should be manually isolated

**APPENDIX D**  
**CLP GUIDELINES**

**ROUTINE ANALYTICAL SERVICES**  
**(RAS)**

**Contract Laboratory Program**

**USEPA Sample Management Office**

## **Low/Medium Concentration Inorganic RAS**

- **Target Analyte List**
  - **Total Metals (Unfiltered)**
  - **Dissolved Metals (Field Filtered)**
  - **Cyanide**
- **AA or ICP Methods**
- **35-day Data Turnaround**



## **High Concentration Inorganic RAS**

- **Target Analyte List**
  - **Total Metals**
  - **Cyanide**
- **Hydride ICP**
- **Lab Screens for Concentration**
- **35-Day Data Turnaround**



## **Laboratory Quality Control (QC) High Concentration Inorganic RAS**

- **Matrix Spike**
- **Duplicate**
- **Lab Control Sample**
- **Double Volume Field Sample for Waters**
- **QC Needed for Each SDG**



## **CLP Samples**

**A Sample is All Volume:**

- 1) **Of One Matrix**
- 2) **From One Station Location**
- 3) **For One Analytical Program**
- 4) **For One Laboratory**

**Each Sample is Assigned a Unique  
Sample Number**





## **RAS Requests - Required Information**

- **Site Name**
- **Location: City and State**
- **Site/Spill Code**
- **Type of Activity**
- **Sampling Organization, Contact, and Phone Number**
- **Sampling and Shipping Dates**
- **Number of Samples By Concentration and Matrix**
- **Parameters Required**
- **Known or Suspected Hazards**



## **Sample Documentation**

- **Creates a Legal "Paper Trail" for Enforcement**
- **Data Base on Sample Level**
- **CLP Paperwork and Tracking Systems Audited**
- **Case Numbers, SAS Numbers Reflect Different Contracts**
- **Contract Compliance Screening**
- **Late Data Tracking**
- **Billing and Accounting**



## **Potential Problems with Sample Shipment and Analysis**

- **Incorrect or Incomplete Paperwork**
- **Laboratory Receipt of Incorrect Samples**
- **Insufficient Volume for Analysis Requested**
- **Broken or Leaking Samples**
- **Matrices other than Water or Soil  
(i.e., Rocks, Leaves, Sticks, Oil, Etc.)**
- **Non-Homogeneous/Multi-Phase Water or  
Soil Samples**
- **Analytical Problems with Samples**
- **Laboratory Accidents Involving Samples**

***If Any of These Problems Are Encountered,  
Contact SMO Immediately***

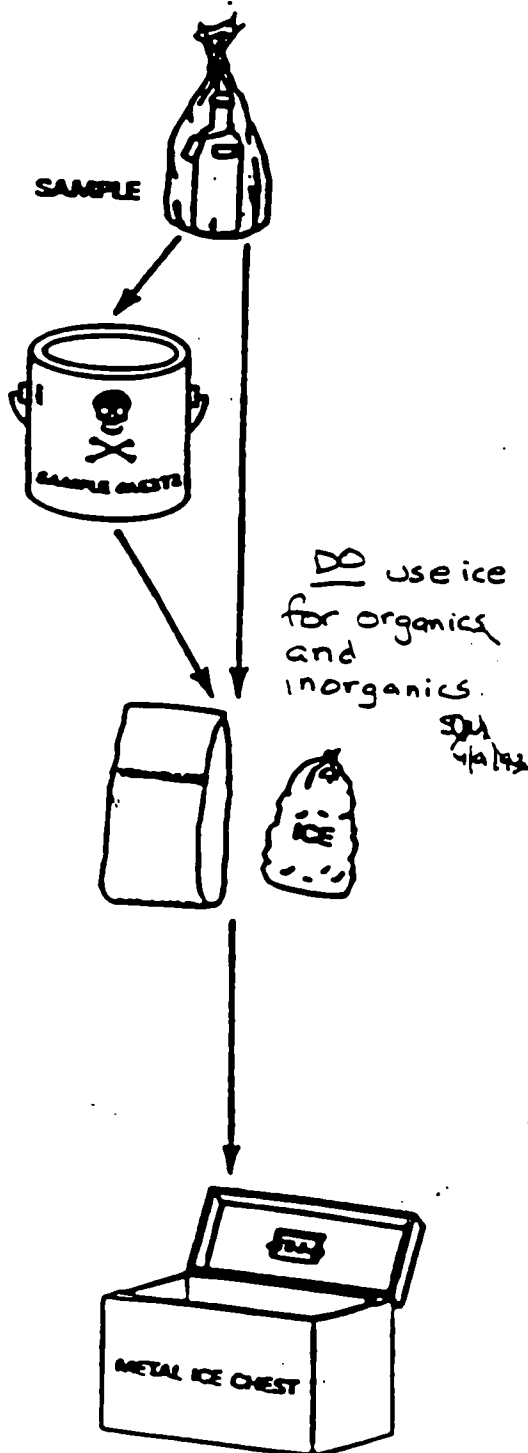


## **RAS Summary**

- **Standardized Analyses for Organics and  
Inorganics**
- **Low/Medium Concentration Waters and  
Soils**
- **High Concentration Multi-Phase Samples**
- **One Week Leadtime**
- **Projects Designated by a Case Number,  
Example: Case No. 17000**



# SAMPLE PACKAGING SUMMARY



- ENCLOSE ALL SAMPLE CONTAINERS IN CLEAR PLASTIC BAGS.
- PACK ALL MEDIUM AND HIGH LEVEL WATER AND SOIL SAMPLES IN METAL PAINT CANS.
- LABEL PAINT CANS WITH SAMPLE NUMBER OF SAMPLE CONTAINED INSIDE.
- SURROUND CONTENTS OF CAN WITH NON-COMBUSTIBLE, ABSORBENT PACKING MATERIAL.
- USING FREEZER PACKAGES OR ICE SEALED IN PLASTIC BAGS, COOL ORGANIC LOW OR MEDIUM SAMPLES AND INORGANIC SAMPLES TO BE ANALYZED FOR CYANIDE TO 4°C.
- ICE IS NOT REQUIRED IN SHIPPING LOW LEVEL SOIL SAMPLES, BUT MAY BE UTILIZED AT THE DISCRETION OF THE SAMPLER.
- DO NOT COOL DIOXIN, INORGANIC LOW LEVEL WATER, INORGANIC MEDIUM/HIGH LEVEL WATER OR SOIL, OR ORGANIC HIGH LEVEL WATER OR SOIL SAMPLES.
- PACK SEALED PAINT CANS OR PLASTIC-ENCLOSED SAMPLE BOTTLES IN SHIPMENT CONTAINER.
- USE A METAL ICE CHEST FOR SHIPMENT (DO NOT USE CARDBOARD OR STYROFOAM CONTAINERS TO SHIP SAMPLES).
- SURROUND CONTENTS WITH NON-COMBUSTIBLE, ABSORBENT PACKING MATERIAL (DO NOT USE EARTH OR ICE PACKING MATERIALS).
- TAPE PAPERWORK IN PLASTIC BAGS UNDER COOLER LID.
- CLOSE COOLER AND SEAL WITH CUSTODY SEALS.

Project Code 6-85231		Account Code SF-05		2. Region No VI		Sampling Co. VIAR + CO.		4. Date Shipped 11/13/91		Carrier FEDERAL EXPRESS		N/A		17892	
Regional Information				Sampler (Name) KEVIN K. CONNELL				A. Ship To NATFEX / GULF SOUTH ENVIRON. LAB				6. Preservative (Enter in Column D)		7. Sample Description (Enter in Column A)	
Non-Superfund Program				Sampler Signature K.K. Connell				B. Ship To 6801 PRESS DR., EAST BLDG.				1. HCl		1. Surface Water	
Site Name Dioxins '8' US				3. Type of Activity				NEW ORLEANS, LA 70126				2. HNO3		2. Ground Water	
City, State DALLAS, TX				<div style="display: flex; justify-content: space-between;"> <div> SF <input type="checkbox"/> PRP <input type="checkbox"/> ST <input type="checkbox"/> FED <input type="checkbox"/> </div> <div> PA <input type="checkbox"/> SS <input type="checkbox"/> LSI <input type="checkbox"/> </div> <div> RIFS <input type="checkbox"/> RD <input type="checkbox"/> RA <input type="checkbox"/> O&amp;M <input type="checkbox"/> NPLD <input type="checkbox"/> </div> <div> CLEM <input checked="" type="checkbox"/> REM <input type="checkbox"/> OIL <input type="checkbox"/> UST <input type="checkbox"/> </div> </div>				ATTN: KAREN BRANDT				3. H2SO4		3. Leachate	
Site Spill ID 77												4. Other (SAS) (Specify)		4. Rinse	
												5. Ice only		5. Sol/Sediment	
												6. Not preserved		6. Oil (SAS)	
														7. Waste (SAS) (Specify)	
														8. Other (SAS) (Specify)	

CLP Sample Numbers (from labels)	A Enter # from Box 7	B Conc Low Med High	C Sample Type: Comp/Grab	D Preservative from Box 6	E RAS Analysis				F Regional Specific Tracking Number or Tag Numbers	G Station Location Number	H Mo/Day/Year/Time Sample Collection	I Sampler Initials	J Corresp. CLP Inorg. Samp. No.	K Designated Field OC
					VOA	BNA	Peat/PCB	High ARO/TOX						
FL 140	5	L	G	N			X		6-14738	SS-01	11/13/91, 9:15	KC	MFL 140	<div style="border: 1px solid black; padding: 5px;">           Trip Blank         </div>
FL 141	5	L	G	N			X		6-14739	SS-02	11/13/91, 9:30	KC	MFL 141	
FL 142	1	L	G	N			X		6-14740	SW-01	11/13/91, 11:00	KC	MFL 142	
FL 142	1	L	G	N			X		6-14741	SW-01	11/13/91, 11:00	KC	MFL 142	
FL 142	1	L	G	N			X		6-14742	SW-01	11/13/91, 11:00	KC	MFL 142	
FL 143	2	L	G	N			X		6-14743	GW-01	11/13/91, 1:45	KC	MFL 143	
FL 144	1	L	G	N	X				6-14744			KC		

Shipment for Case complete? (Y/N)	Page 1 of 1	Sample used for a spike and/or duplicate FL 140; FL 142	Additional Sampler Signatures	Chain of Custody Seal Number 789462
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#### CHAIN OF CUSTODY RECORD

Relinquished by: (Signature) K.K. Connell	Date / Time 11/13/91 4:20	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Received by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks	Is custody seal intact? Y/N/none

EPA Form 9110-2 (Rev. 5-91) Replaces EPA Form (2075-7), previous edition which may be used

DISTRIBUTION

Blue - Region      Pink - SMO Copy      White - Lab Copy      Yellow - Lab Copy for Return to SMR

Split Samples ☐ Accepted (Signature)

☐ Declined

and white by yellow  
 Lab.

This form replaces both the individual Traffic Report and EPA Chain of Custody Record. If the sampling elements to use an alternative chain-of-custody form, cross out the bottom portion of this record and indicate that chain-of-custody information is recorded on an alternative form.

Water Samples	Required Volume	Container type
Extractable Analysis (Low Level)	Gallon	1 X 4-Liter Amber Glass Bottle
		OR
		2 X 80-oz Amber Glass Bottle
		OR
		4 X 1-Liter Amber Glass Bottles
Extractable Analysis (Medium Level)	Gallon	32-oz. Wide-Mouth Glass Jars
Volatile Analysis (Low or Medium Level)	60 ml	2 X 40-ml. Glass Vials



\*All Medium and High Level Samples to be Sealed in Metal Can for Shipment

Soil/Sediment Samples	Required Volume	Container type
Extractable Analysis (Low or Medium Level)	5 oz	1 X 8-oz Wide-Mouth Glass Jar
	240 ml	2 X 4-oz Wide-Mouth Glass Jars
Volatile Analysis (Low or Medium Level)		2 X 120-ml Wide-Mouth Glass Jars

\*Sol VOA Vials under study, subject to change. Check to ensure proper labeling

### HIGH CONCENTRATION SAMPLE COLLECTION REQUIREMENTS

Liquid or Solid Samples	Required Volume	Container type
Extractable and Volatile Analysis	5 oz.	1 X 8-oz Wide-Mouth Glass Jar

- Organic Sample Collection Requirements**
  - Please indicate sample to spike and/or duplicate.
  - Ship medium and high concentration samples in paint cans.
  - Aqueous samples require one triple-volume sample per twenty for Matrix Spike/Matrix Spike Duplicate.
  - Oily samples must be analyzed under the Special Analytical Services (SAS) program.
  - Confirmatory analysis and Special Analytical Services (SAS) parameters may require extra volume: for SAS consult specified SAS methods for requirements.
  - Additional sample volume not required for method OLC01.
- Cooler and Sample Documentation**
  - Complete all sections of the Traffic Report/Chain of Custody Form - Press firmly with a ball point pen to ensure that carbon copies are legible. Check the information and correct any errors.
  - Please remember to complete the Chain of Custody information on the form.
  - Seal the two sets of laboratory Traffic Report/Chain of Custody form copies in a plastic bag. Include a return address for the cooler. Tape bag under cooler lid.
  - Overlap the lid and bottle and bottle of each sample container with custody seals.
  - Seal each container in a plastic bag.
  - Pack medium and high concentration samples in metal cans.
  - Cool low waters to 4° C. Cooling of low soils is optional. Do not cool medium or high concentration waters and soils.
  - Separate and surround cooler contents with vermiculite or equivalent packaging.
  - Seal the cooler, overlapping the lid and body with custody seals.
  - FAX SMO a copy of the Traffic Report/Chain of Custody Form as soon as possible. Send SMO the pink copy of the Traffic Report within 5 days.
  - In column E RAS analysis indicate number of sample bottles sent for analysis.
- Sample Shipment Reporting**
  - PHONE IN ALL SHIPMENTS IMMEDIATELY TO SMO (or to RSCC, if instructed)
  - Required information:
    - Case (and/or SAS) Number
    - Date shipped
    - Number of samples by concentration and matrix
    - Carrier and airbill number
    - Next planned shipment
  - Leave your name and a number where you can be reached.
  - Information for SATURDAY DELIVERIES must be phoned in by 3:00 PM (Eastern) the preceding FRIDAY.
  - Report any delays or changes of scope (i.e., changes in number of samples to be collected, matrix changes, etc.)
  - CALL IF YOU HAVE ANY QUESTIONS
    - USEPA Contract Laboratory Program
    - Sample Management Office
    - P.O. Box 818
    - Alexandria, VA 22313
    - Phone: (703) 557-2490
    - (703) 684-5678
    - FAX: (703) 683-0378



<b>1 Sample Description</b> (Enter in Column A) 1 Surface Water 2 Ground Water 3 Leachate 4 Rinse 5 Soil/Sediment 6 Oil (SAS) 7 Waste (SAS) 8 Other (SAS) (Specify)		<b>2 Preservative</b> (Enter in Column D) 1 HCl 2 HNO <sub>3</sub> 3 NaOH 4 H <sub>2</sub> SO <sub>4</sub> 5 K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> 6 Ice only 7 Other (SAS) (Specify) 8 Not preserved		<b>3 Region No</b>  <b>Sampling Co</b>  <b>Sampler (Name)</b>  <b>Sampler Signature</b>  <b>4 Type of Activity</b> Lead Remedial SF PRP ST ED PA SSI LSI RIFS RD RA O&M NPLD CLEM REMA REM OIL UST		<b>5 Date Shipped</b>  <b>Carrier</b>  <b>Airbill Number</b>  <b>6 Ship To</b>  <b>7 Date Received</b>  <b>Received by</b>  <b>Laboratory Contract Number</b>  <b>Unit Price</b>  <b>8 Transfer to</b>  <b>Date Received</b>  <b>Contract Number</b>  <b>Price</b>								
<b>CLP Sample Numbers</b> (from label)	<b>A Enter # from Box 1</b>	<b>B Conc Low Med High</b>	<b>C Sample Type Comp / Grab</b>	<b>D Preservative from Box 6</b>	<b>E RAS Analysis</b> Metals Total Dissolved Cyanide Low Conc High Conc pH Conductivity		<b>F Regional Specific Tracking Number or Tag Numbers</b>	<b>G Station Location Number</b>	<b>H Mo/Day/Year/Time Sample Collection</b>	<b>I Sampler Initials</b>	<b>J Corresp. CLP Org. Samp. No</b>	<b>K Sample Condition on Receipt</b>	<b>L High Conc. Phases (Check below)</b> Solids Water - MS Lq Non Water - MS Lq	
Shipment for Case complete? (Y/N)		Page 1 of		Sample used for a spike and/or duplicate		Additional Sampler Signatures		Chain of Custody Seal Number						

CHAIN OF CUSTODY RECORD

Relinquished by (Signature)	Date / Time	Received by (Signature)	Relinquished by (Signature)	Date / Time	Received by (Signature)
Relinquished by (Signature)	Date / Time	Received by (Signature)	Relinquished by (Signature)	Date / Time	Received by (Signature)
Received by (Signature)	Date / Time	Received for Laboratory by (Signature)	Date / Time	Remarks	Is custody seal intact? Y/N/None
Split Samples		Accepted (Signature)			
		Declined			

EXHIBIT C

TARGET COMPOUND LIST (TCL) AND  
CONTRACT REQUIRED QUANTITATION LIMITS (CRQL)

LOW/MEDIUM CONC.  
RAS ORGANIC

NOTE: The values in these tables are quantitation limits, not absolute detection limits. The amount of material necessary to produce a detector response that can be identified and reliably quantified is greater than that needed to simply be detected above the background noise. The quantitation limits in these tables are set at the concentrations in the sample equivalent to the concentration of the lowest calibration standard analyzed for each analyte.

Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

The CRQL values listed on the following pages are based on the analysis of samples according the specifications given in Exhibit D. For each fraction and matrix, a brief synopsis of the sampling handling and analysis steps is given, along with an example calculation for the CRQL value. All CRQL values are rounded to two significant figures. For soil samples, the moisture content of the samples is not considered in these example calculations.

TARGET COMPOUND LIST (TCL) AND CONTRACT REQUIRED QUANTITATION LIMITS (CRQL)

Pesticides/Aroclors	CAS Number	Quantitation Limits*		
		Water ug/L	Soil ug/Kg	On Column (pg)
98. alpha-BHC	319-84-6	0.05	1.7	5
99. beta-BHC	319-85-7	0.05	1.7	5
100. delta-BHC	319-86-8	0.05	1.7	5
101. gamma-BHC (Lindane)	58-89-9	0.05	1.7	5
102. Heptachlor	76-44-8	0.05	1.7	5
103. Aldrin	309-00-2	0.05	1.7	5
104. Heptachlor epoxide	1024-57-3	0.05	1.7	5
105. Endosulfan I	959-98-8	0.05	1.7	5
106. Dieldrin	60-57-1	0.10	3.3	10
107. 4,4'-DDE	72-55-9	0.10	3.3	10
108. Endrin	72-20-8	0.10	3.3	10
109. Endosulfan II	33213-65-9	0.10	3.3	10
110. 4,4'-DDD	72-54-8	0.10	3.3	10
111. Endosulfan sulfate	1031-07-8	0.10	3.3	10
112. 4,4'-DDT	50-29-3	0.10	3.3	10
113. Methoxychlor	72-43-5	0.50	17.0	50
114. Endrin ketone	53494-70-5	0.10	3.3	10
115. Endrin aldehyde	7421-36-3	0.10	3.3	10
116. alpha-Chlordane	5103-71-9	0.05	1.7	5
117. gamma-Chlordane	5103-74-2	0.05	1.7	5
118. Toxaphene	8001-35-2	5.0	170.0	500
119. Aroclor-1016	12674-11-2	1.0	33.0	100
120. Aroclor-1221	11104-28-2	1.0	33.0	100
121. Aroclor-1232	11141-16-5	2.0	67.0	200
122. Aroclor-1242	53469-21-9	1.0	33.0	100
123. Aroclor-1248	12672-29-6	1.0	33.0	100
124. Aroclor-1254	11097-69-1	1.0	33.0	100
125. Aroclor-1260	11096-82-5	1.0	33.0	100

\* Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

There is no differentiation between the preparation of low and medium soil samples in this method for the analysis of Pesticides/Aroclors.



**APPENDIX E**  
**SITE EVALUATION CHECKLIST**

## I. SITE INSPECTION INFORMATION

- ## II. GENERAL SITE INFORMATION

1. \_\_\_\_\_ Official site name / CERCLIS ID: \_\_\_\_\_ (TXD \_\_\_\_\_)
2. \_\_\_\_\_ Accurate street address: \_\_\_\_\_
3. \_\_\_\_\_ City and State: \_\_\_\_\_
4. \_\_\_\_\_ List current owner(s) name(s) and address(es): \_\_\_\_\_
5. \_\_\_\_\_ List past site owners and addresses, if possible: \_\_\_\_\_
5. \_\_\_\_\_ Indicate ownership type ("C" for current, "P" for past)
- |                    |                                  |
|--------------------|----------------------------------|
| a. _____ Private   | e. _____ Federal                 |
| b. _____ Municipal | f. _____ DOD                     |
| c. _____ County    | g. _____ DOE                     |
| d. _____ State     | h. _____ Indian                  |
| e. _____ Unknown   | i. _____ Other (describe): _____ |
- B. \_\_\_\_\_ Verify site location on a topo map, indicating the reason for any discrepancies below:

**SITE RECONNAISSANCE CHECKLIST**  
**SITE FEATURES WORKSHEET**

**III. SITE FEATURES**

1. ☐ Draw a sketch map of the site to show the location of important site features
2. ☐ Describe site access features:
  - a. Locations where the site can be accessed: \_\_\_\_\_
  - b. Major roads leading to site: \_\_\_\_\_
  - c. On-site roads / paths and their condition: \_\_\_\_\_
  - d. Location/condition of barricades impeding site access: \_\_\_\_\_
3. ☐ List current/historic site occupants and landuse:
  - a. \_\_\_\_\_
  - b. \_\_\_\_\_
  - c. \_\_\_\_\_
  - d. \_\_\_\_\_
4. ☐ Indicate the nature of the site occupant(s) (put corresponding letter from above beside type below)

<ol style="list-style-type: none"><li>a. <input type="checkbox"/> Lumber or wood products</li><li>b. <input type="checkbox"/> Inorganic chemicals</li><li>c. <input type="checkbox"/> Plastics or rubber products</li><li>d. <input type="checkbox"/> Paints or varnishes</li><li>e. <input type="checkbox"/> Industrial organic chemicals</li><li>f. <input type="checkbox"/> Agricultural chemicals</li><li>g. <input type="checkbox"/> Misc. chemical products</li><li>h. <input type="checkbox"/> Fabricated structural metal products</li><li>i. <input type="checkbox"/> Electronic equipment</li><li>j. <input type="checkbox"/> Other manufacturing: _____</li><li>k. <input type="checkbox"/> Mining and other exploration: _____</li></ol>	<ol style="list-style-type: none"><li>l. <input type="checkbox"/> Retail</li><li>m. <input type="checkbox"/> Recycling</li><li>n. <input type="checkbox"/> Junk/salvage yard</li><li>o. <input type="checkbox"/> Municipal landfill</li><li>p. <input type="checkbox"/> DOD</li><li>q. <input type="checkbox"/> DOE</li><li>r. <input type="checkbox"/> DOI</li><li>s. <input type="checkbox"/> Other federal facility: _____</li><li>t. <input type="checkbox"/> RCRA TSD site: _____</li><li>u. <input type="checkbox"/> RCRA generator: _____</li><li>v. <input type="checkbox"/> Other RCRA: _____</li><li>x. <input type="checkbox"/> Other: _____</li></ol>
--	---
5. ☐ Status:      a. ☐ Active      b. ☐ Inactive or left site
6. ☐ Describe buildings or other structures (occupant, size, location, use)
  - a. \_\_\_\_\_
  - b. \_\_\_\_\_
  - c. \_\_\_\_\_
  - d. \_\_\_\_\_
  - e. \_\_\_\_\_
7. ☐ Locate and describe the following:
  - a. ☐ Municipal water supply hook ups, if any
  - b. ☐ Storm drain inlets or discharge points
  - c. ☐ Sanitary sewers
  - d. ☐ Parking lots and other impervious surfaces
  - e. ☐ Water wells
  - f. ☐ Oil and gas wells
  - g. ☐ Mining activities onsite:
  - h. ☐ Rail spur locations (usage):
  - i. ☐ Pipelines (owner/contents):
  - j. ☐ Other easements: \_\_\_\_\_

**SITE RECONNAISSANCE CHEIST  
SITE FEATURES WORKSHEET CONTINUED**

**IV. NATURAL SITE FEATURES**

1. ☐ Describe regional and site topography \_\_\_\_\_
2. ☐ Determine the site surface gradient / slope \_\_\_\_\_
3. ☐ Describe site and adjacent property vegetation \_\_\_\_\_
4. ☐ Describe site surface soils (texture, color, structure) \_\_\_\_\_
  
5. ☐ Describe site and local surface geological features (lithology, structures, grain size)
  
6. ☐ Locate and map nearby surface water bodies surface:
  - a. Determine the dimensions and profile of each surface water body
  
  - b. Describe flow rate and direction of flow, if any
  
  - c. Indicate the type surface water usage (fisheries, water intakes)
  
7. ☐ Locate and map any springs, seeps, ponded areas or wetlands
8. ☐ Locate and map any drainage swales or ditches onsite
9. ☐ Determine the direction and destination of site runoff \_\_\_\_\_
10. ☐ List other potentially sensitive environments
  - a. \_\_\_\_\_
  - b. \_\_\_\_\_
  - c. \_\_\_\_\_

**V. OTHER NOTABLE SITE FEATURES**

1. ☐ Describe any other notable site features below:

**SITE RECONNAISSANCE CHECKLIST**  
**SITE OPERATIONAL HISTORY CHECKLIST**

**VI. SITE OPERATIONAL HISTORY**

1. \_\_\_\_ Describe the exact types and quantities of wastes stored and generated (what/when):
  - a. \_\_\_\_\_
  - b. \_\_\_\_\_
  - c. \_\_\_\_\_
  - d. \_\_\_\_\_
  - e. \_\_\_\_\_
  - f. \_\_\_\_\_
2. \_\_\_\_ Determine the locations of historic waste disposal practices onsite (check as source area below)
3. \_\_\_\_ Map and describe historic buildings, storage areas or process areas no longer obvious onsite:
4. \_\_\_\_ Determine the current/historical number of occupants or workers onsite daily \_\_\_\_\_  
1
5. \_\_\_\_ Describe in detail the current/historical processes used onsite:
6. \_\_\_\_ List site environmental related permits (RCRA, TACB, TWC, TRRC, TDH, etc.)
  - a. \_\_\_\_\_
  - b. \_\_\_\_\_
  - c. \_\_\_\_\_
  - d. \_\_\_\_\_
7. \_\_\_\_ Get copies of any manifests or other records available
8. Describe other relevant facts concerning site operations:

**SITE RECONNAISSANCE CHEMIST  
POTENTIAL WASTE SOURCES IDENTIFICATION WORKSHEET**

A. Check the potential waste sources below which are found onsite:

1. ☐ Dry wells or injection wells
2. ☐ Ponds, lagoons or other surface impoundment
3. ☐ Landfills
4. ☐ Land treatment or land farming areas
5. ☐ Areas of contaminated soil
6. ☐ Storage tanks or other nondrum containers
7. ☐ Drums or drum-like containers
8. ☐ Incineration areas or burn pits
9. ☐ Piles (Chemical, scrap metals, tailings, etc.)
10. ☐ Ventilation systems
11. ☐ Hydraulic lifts
12. ☐ Pits or sumps
13. ☐ Transformers
14. ☐ Contaminated sediments or surface water with unidentified source
15. ☐ Contaminated groundwater with unidentified source
16. ☐ Other source type (describe: \_\_\_\_\_)
17. ☐ No sources identified

# SITE RECONNAISSANCE CHEMIST WASTE SOURCE DESCRIPTION WORKSHEET

(Complete one sheet for each source area)

1. ☐ Assign waste source a name for identification: \_\_\_\_\_
2. ☐ Status of source area (closed, inactive, active) \_\_\_\_\_
3. ☐ Locate the source area on a map and describe location: \_\_\_\_\_
4. ☐ Measure the dimensions of the source area: \_\_\_\_\_
5. ☐ Determine the length of time that the source area contained waste: \_\_\_\_\_
6. ☐ Describe the method of source containment and degree of maintenance: \_\_\_\_\_
7. ☐ Describe the method of secondary containment and maintenance: \_\_\_\_\_
8. ☐ Indicate the current and historical contents of source area:
 

a. <input type="checkbox"/> Metals	i. <input type="checkbox"/> Paints/pigments/dyes
b. <input type="checkbox"/> Inorganics	j. <input type="checkbox"/> Solvents
c. <input type="checkbox"/> Organics	k. <input type="checkbox"/> Laboratory/hospital waste
d. <input type="checkbox"/> Radioactive waste	l. <input type="checkbox"/> Construction/demolition waste
e. <input type="checkbox"/> Pesticides/herbicides	m. <input type="checkbox"/> Acids/bases
f. <input type="checkbox"/> Oily waste	n. <input type="checkbox"/> Municipal/residential type waste
g. <input type="checkbox"/> Mining waste	o. <input type="checkbox"/> Other (describe) _____
h. <input type="checkbox"/> Explosives	
9. ☐ Describe the physical state of the waste (check one)
 

a. <input type="checkbox"/> Solid	b. <input type="checkbox"/> Powder
c. <input type="checkbox"/> Liquid	d. <input type="checkbox"/> Sludge
e. <input type="checkbox"/> Gas	
10. ☐ Determine the location of waste generation:
 

a. <input type="checkbox"/> onsite	b. <input type="checkbox"/> offsite (generator): _____
------------------------------------	--
11. ☐ Indicate who authorized waste deposition:
 

a. <input type="checkbox"/> Present owner	c. <input type="checkbox"/> Unauthorized
b. <input type="checkbox"/> Former owner	d. <input type="checkbox"/> Unknown
12. ☐ Assess the accessibility of the source area to the public:
 

a. <input type="checkbox"/> Accessable	b. <input type="checkbox"/> Nonaccessable (why): _____
--	--
13. ☐ Current and historical high level of containment
14. ☐ Method of secondary containment and degree of maintenance
15. ☐ Indicate if there is visual evidence of a release
 

a. <input type="checkbox"/> Discharges or waste streams (Indicate receiving body): _____
b. <input type="checkbox"/> Leachate outbreak
c. <input type="checkbox"/> Spill or leak
d. <input type="checkbox"/> Other type of release (describe): _____
16. ☐ Indicate if there is visual evidence of contamination around source
 

a. <input type="checkbox"/> Stained/contaminated soil (area): _____
b. <input type="checkbox"/> No evidence of
17. ☐ Describe cover over the source area
 

a. <input type="checkbox"/> Engineered cap
b. <input type="checkbox"/> Buried (w/soil, asphalt, etc.)
c. <input type="checkbox"/> Other (Roof, tarp, etc.)
18. ☐ Functioning collection or venting system (describe in detail)
19. ☐ Evidence of biogas release (odors, vapors, FID response)
20. ☐ Describe Vegetation around source area:
 

a. Type and degree of vegetation: _____
b. Condition of vegetation (stressed/unaffected): _____

# VIII. OFFSITE SURVEY

1. \_\_\_\_\_ Describe and locate \_\_\_\_\_ map adjacent and nearby sites of interest:

- a. \_\_\_\_\_
- b. \_\_\_\_\_
- c. \_\_\_\_\_

2. \_\_\_\_\_ Map location of public facilities (schools, day care facilities, parks, etc.)

- a. \_\_\_\_\_
- b. \_\_\_\_\_
- c. \_\_\_\_\_

3. \_\_\_\_\_ Determine the location and number of residences within a 1/2 mile radius of the site:

4. \_\_\_\_\_ Determine the population of workers, schoolchildren, etc in areas near the site

5. \_\_\_\_\_ List alternative source sites within a four mile radius:

a. Automobile service stations

- 1. \_\_\_\_\_
- 2. \_\_\_\_\_

b. Dry cleaners

- 1. \_\_\_\_\_
- 2. \_\_\_\_\_

c. Manufacturing/industrial sites

- 1. \_\_\_\_\_
- 2. \_\_\_\_\_

d. Rail loading areas

- 1. \_\_\_\_\_

e. Landfills

- 1. \_\_\_\_\_

f. Other sites

- 1. \_\_\_\_\_

6. \_\_\_\_\_ Locate and describe surface water bodies as follows:

- a. Distance to probable point of entry of a waste from the site
- b. Flow rate and direction of flow
- c. Storm drains discharging into the surface water body
- d. Potential targets along the surface water
- e. Branching in surface water flow path and effect on target
- f. Tidal influence effect on flow
- g. Tributaries with alternative source sites
- h. Drinking water intakes
- i. Fishing or other recreational use recreation

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

7. \_\_\_\_\_ Locate and describe water wells in the distance limit, as possible:

- a. Location of well and distance from site
- b. Well owner and population potentially served
- c. Well usage and completion information

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_